Changes for the Better

MITSUBISHI ELECTRIC

AIR TO WATER HEAT PUMP

August 2007

No. OCH419

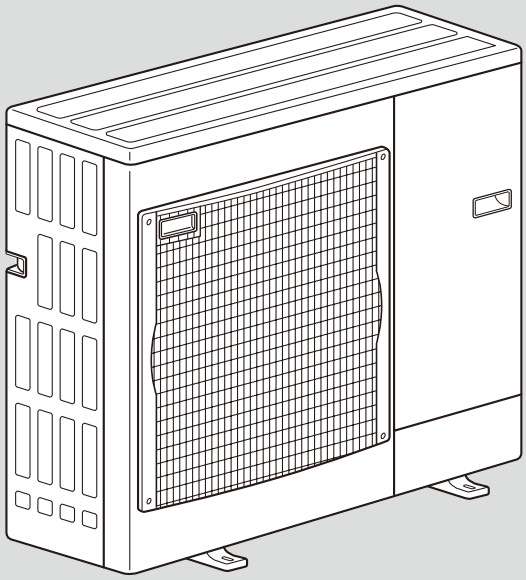
SERVICE MANUAL

R410A

[model name] **[Service Ref.]**

PUHZ-W90VHA **PUHZ-W90VHA**

Note:
- This manual describes only service data of PUHZ-W90VHA.
- RoHS compliant products have <G> mark on the spec name plate.



PUHZ-W90VHA

CONTENTS

1. SAFETY PRECAUTION ····· 2
2. SPECIFICATIONS ····· 4
3. DATA ····· 5
4. OUTLINES AND DIMENSIONS ····· 7
5. WIRING DIAGRAM ····· 8
6. WIRING SPECIFICATIONS ····· 9
7. REFRIGERANT SYSTEM DIAGRAM ····· 10
8. TROUBLESHOOTING ····· 11
9. DISASSEMBLY PROCEDURE ····· 38

PARTS CATALOG (OCB419)

1 SAFETY PRECAUTION

1-1. ALWAYS OBSERVE FOR SAFETY

Before obtaining access to terminal, all supply ciucuits must be disconnected.

1-2. CAUTIONS RELATED TO NEW REFRIGERANT

Cautions for units utilizing refrigerant R410A

Do not use refrigerant other than R410A.

If other refrigerant (R22 etc.) is used, chlorine in refrigerant can cause deterioration of refrigerant oil etc.

Use a vacuum pump with a reverse flow check valve.

Vacuum pump oil may flow back into refrigerant cycle and that can cause deterioration of refrigerant oil etc.

Use the following tools specifically designed for use with R410A refrigerant.

The following tools are necessary to use R410A refrigerant.

Tools for R410A	
Gauge manifold	Vacuum pump adaptor
Charge hose	Electronic refrigerant charging scale
Gas leak detector	
Torque wrench	

Keep tools with care.

If dirt, dust or moisture enters into refrigerant cycle, that can cause deterioration of refrigerant oil or malfunction of compressor.

Do not use a charging cylinder.

If a charging cylinder is used, the composition of refrigerant will change and the efficiency will be lowered.

Ventilate the room if refrigerant leaks during operation. If refrigerant comes into contact with a flame, poisonous gases will be released.

Charge refrigerant from liquid phase of gas cylinder.

If the refrigerant is charged from gas phase, composition change may occur in refrigerant and the efficiency will be lowered.

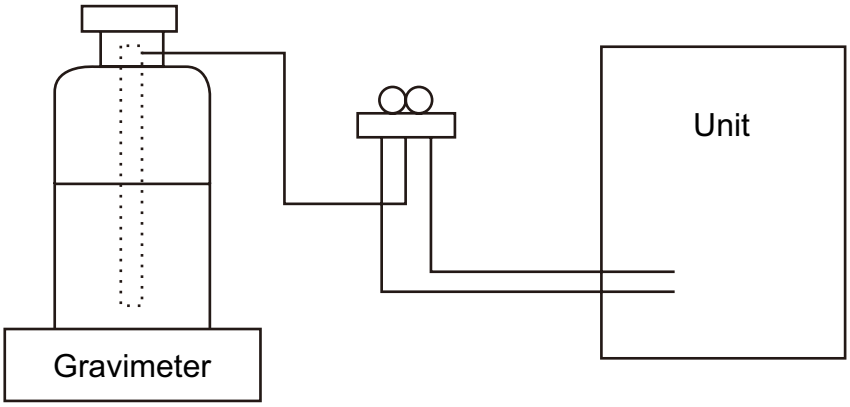
[1] Cautions for service

(1) Perform service after recovering the refrigerant left in unit completely.
(2) Do not release refrigerant in the air.
(3) After completing service, charge the cycle with specified amount of refrigerant.

[2] Additional refrigerant charge

When charging directly from cylinder

· Check that cylinder for R410A on the market is syphon type.
· Charging should be performed with the cylinder of syphon stood vertically. (Refrigerant is charged from liquid phase.)



[3] Service tools

Use the below service tools as exclusive tools for R410A refrigerant.

No.		Specifications
①	Gauge manifold	·Only for R410A
		·Use the existing fitting specifications. (UNF1/2)
		·Use high-tension side pressure of 5.3MPa·G or over.
②	Charge hose	·Only for R410A
		·Use pressure performance of 5.09MPa·G or over.
③	Electronic scale	——
④	Gas leak detector	·Use the detector for R134a, R407C or R410A.
⑤	Adaptor for reverse flow check	·Attach on vacuum pump.
⑥	Refrigerant charge base	——
⑦	Refrigerant cylinder	·Only for R410A Top of cylinder (Pink) Cylinder with syphon
⑧	Refrigerant recovery equipment	——

1-3. CAUTIONS FOR REFRIGERANT PIPING WORK

Tools for R410A (The following table shows whether conventional tools can be used or not.)

Tools and materials	Use	R410A tools	Can R22 tools be used?	Can R407C tools be used?
Gauge manifold	Air purge, refrigerant charge and operation check	Tool exclusive for R410A	×	×
Charge hose		Tool exclusive for R410A	×	×
Gas leak detector	Gas leak check	Tool for HFC refrigerant	×	○
Refrigerant recovery equipment	Refrigerant recovery	Tool exclusive for R410A	×	×
Refrigerant cylinder	Refrigerant charge	Tool exclusive for R410A	×	×
Safety charger	Prevent compressor malfunction when charging refrigerant by spraying liquid refrigerant	Tool exclusive for R410A	×	×
Charge valve	Prevent gas from blowing out when detaching charge hose	Tool exclusive for R410A	×	×
Vacuum pump	Vacuum drying and air purge	Tools for other refrigerants can be used if equipped with adopter for reverse flow check	△ (Usable if equipped with adopter for reverse flow)	△ (Usable if equipped with adopter for reverse flow)
Bender	Bend the pipes	Tools for other refrigerants can be used	○	○
Pipe cutter	Cut the pipes	Tools for other refrigerants can be used	○	○
Welder and nitrogen gas cylinder	Weld the pipes	Tools for other refrigerants can be used	○	○
Refrigerant charging scale	Charge refrigerant	Tools for other refrigerants can be used	○	○
Vacuum gauge or thermistor vacuum gauge and vacuum valve	Check the degree of vacuum. (Vacuum valve prevents back flow of oil and refrigerant to thermistor vacuum gauge)	Tools for other refrigerants can be used	○	○
Charging cylinder	Refrigerant charge	Tool exclusive for R410A	×	—

× : Prepare a new tool. (Use the new tool as the tool exclusive for R410A.)
△ : Tools for other refrigerants can be used under certain conditions.
○ : Tools for other refrigerants can be used.

2 SPECIFICATIONS

Power supply		Phase	ϕ	1
		Voltage	V	230
		Frequency	Hz	50
Heating (A2/W35)	Capacity		kW	7.0
	COP			3.40
	Power input		kW	2.06
	Nominal water flow		L/min	25.8
Heating (A7/W35)	Capacity		kW	9.0
	COP			3.90
	Power input		kW	2.31
	Nominal water flow		L/min	25.8
Cooling (A35/W7)	Capacity		kW	7.1
	EER (COP)			2.00
	Power input		kW	3.55
	Nominal water flow		L/min	20.4
Cooling (A35/W18)	Capacity		kW	7.1
	EER (COP)			3.70
	Power input		kW	1.92
	Nominal water flow		L/min	20.4

Nominal operating condition	
Heating(A2/W35)	
Outside air temperature (Dry-bulb)	+ 2℃
Outside air temperature (Wet-bulb)	+ 1℃
Water temperature (inlet/outlet)	+30/+35℃
Heating(A7/W35)	
Outside air temperature (Dry-bulb)	+ 7℃
Outside air temperature (Wet-bulb)	+ 6℃
Water temperature (inlet/outlet)	+30/+35℃
Cooling(A35/W7)	
Outside air temperature (Dry-bulb)	+35℃
Outside air temperature (Wet-bulb)	+ 24℃
Water temperature (inlet/outlet)	+12/+7℃
Cooling(A35/W18)	
Outside air temperature (Dry-bulb)	+35℃
Outside air temperature (Wet-bulb)	+ 24℃
Water temperature (inlet/outlet)	+23/+18℃

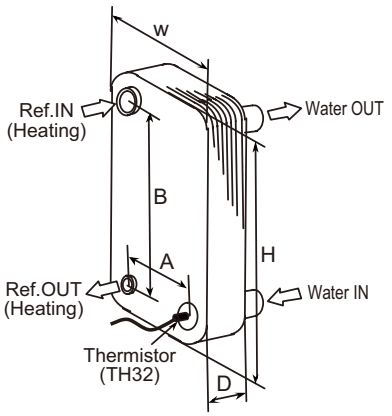
Outdoor unit			
Model name			**PUHZ-W90VHA**
Running current	Heating(A7/W35)	A	10.3
	Cooling(A35/W7)	A	15.7
Max. current		A	23.0
Outer casing			Galvanized plate
External finish			Munsell 3Y 7.8/1.1
Refrigerant control			Linear expansion valve
Compressor			Hermetic twin rotary
	Model		TNB220FLHM1
	Motor output	kW	1.3
	Start type		Line start
	Protection devices		HP switch
			Discharge thermo
	Oil (Model)	L	0.67 (FV50S)
Crankcase heater		W	—
Heat exchanger	(Air)		Plate fin coil
	(Water)		Plate heat exchanger
Fan	Fan(drive)×No.		Propeller fan × 1
	Fan motor output	kW	0.060
	Air flow	m^3/min	55
		(CFM)	(1,940)
Defrost method			Reverse cycle *3
Noise level	Heating	dB	49 *2
	Cooling	dB	49 *2
Dimensions	Width	mm(in.)	950 (37-3/8)
	Depth	mm(in.)	330 +30*1 (13+1-3/16)
	Height	mm(in.)	943 (37-1/8)
Weight		kg(lbs)	79 (174)
Refrigerant			R410A
	Quantity	kg(lbs)	2.4 (5.3)
Guaranteed operating range (Outdoor)	Heating	℃	-20 ～ +35
	Cooling	℃	-5*4 ～ +46
Water flow		L/min	10.0 ～ 25.8

Plate heat exchanger

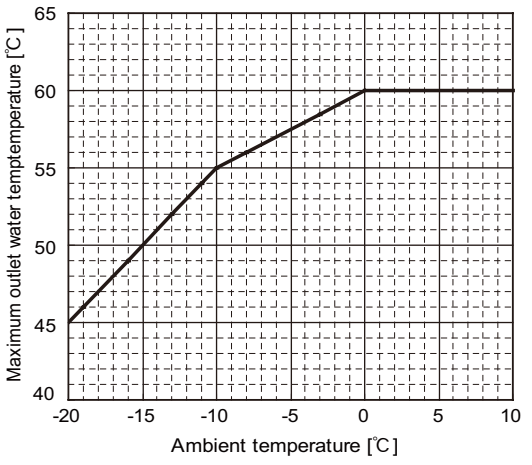
ALFA LAVAL
ACH30-40

A:40.4mm
B:268.2mm

W:93mm
H:325mm
D:69mm
40 plates



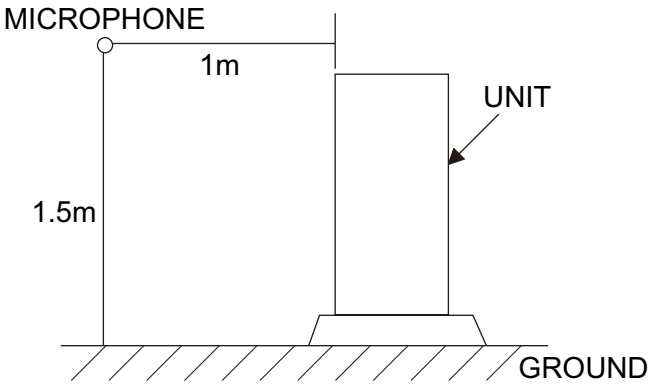
Maximum outlet water temperature



*1 grill
*2 at distance of 1m from outdoor unit
*3 Hot gas with four-way valve
*4 With the optional air outlet guide, the operation at -15℃ outdoor temperature is possible.

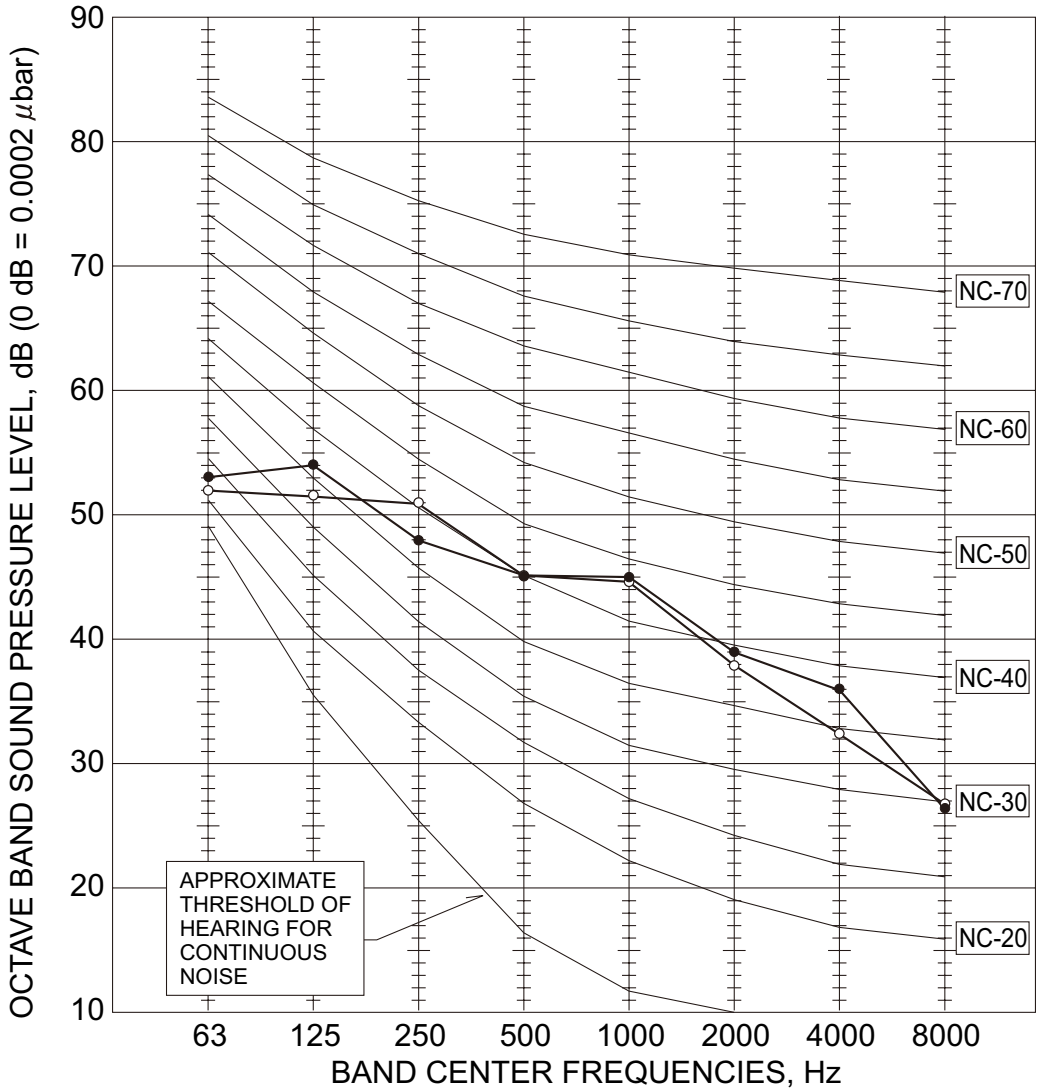
3 DATA

3-1. NOISE CRITERION CURVES



PUHZ-W90VHA

MODE	SPL(dB)	LINE
COOLING	49	○——○
HEATING	49	●——●



3-2. STANDARD OPERATION DATA

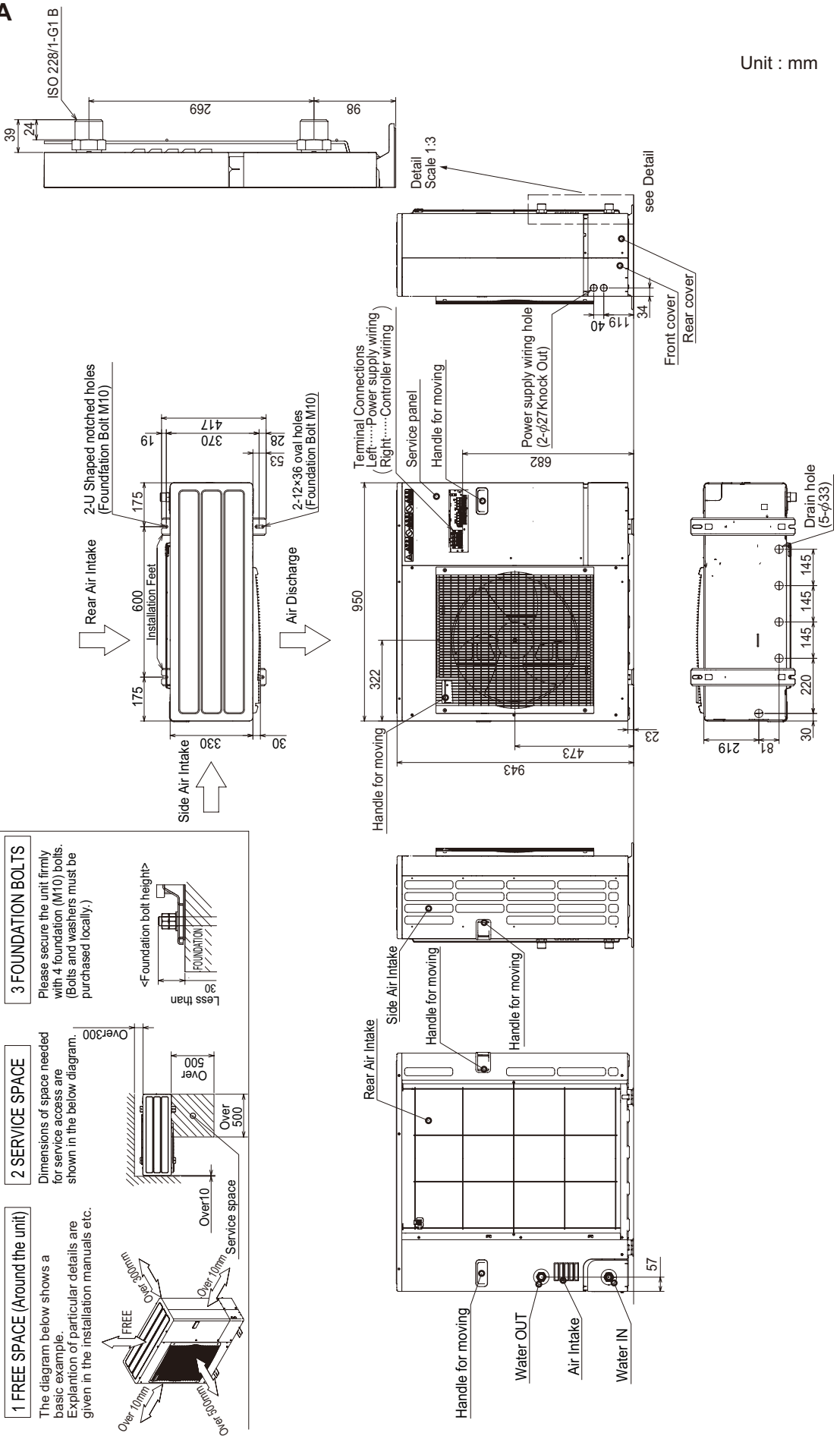
Mode				Cooling (A35/W7)	Heating (A7/W35)
Total	Capacity		W	7,100	9,000
	Input		kW	3.55	2.31
Electrical circuit	Outdoor unit			PUHZ-W90VHA	
	Phase, Hz			1, 50	
	Voltage		V	230	
	Current		A	15.7	10.3
Refrigerant circuit	Discharge pressure		MPa	2.74	2.21
	Suction pressure		MPa	0.73	0.64
	Discharge temperature		℃	74	65
	Condensing temperature		℃	47	38
	Suction temperature		℃	3	-1
Water conditions	Flow volume		L/min	20.4	25.8
	Outlet water temperature		℃	7	35
Outdoor conditions	Intake air temperature	D.B.	℃	35	7
		W.B.	℃	24	6

The unit of pressure has been changed to MPa based on international SI system.
The conversion factor is : 1(MPa)=10.2(kgf/cm^2)

4 OUTLINES AND DIMENSIONS

PUHZ-W90VHA

Unit : mm



5 WIRING DIAGRAM

PUHZ-W90VHA

SYMBOL	NAME
TB1	Terminal Block<Power Supply>
TB2	Terminal Block<Controller>
TB3	Terminal Block<Controller>
MC	Motor for Compressor
MF1	Fan Motor
21S4	Solenoid Valve<Four-Way Valve>
SV	Solenoid Valve<Bypass Valve>
63H	High Pressure Switch
63HS	High Pressure Sensor
TH3	Thermistor<Liquid>
TH4	Thermistor<Discharge>
TH6	Thermistor<Plate HEX liquid>
TH7	Thermistor<Ambient>
TH8	Thermistor<Heatsink>
TH32	Thermistor<Inlet water>
LEV-A, LEV-B	Electronic Expansion Valve
DCL	Reactor
ACTM	Active Filter Module

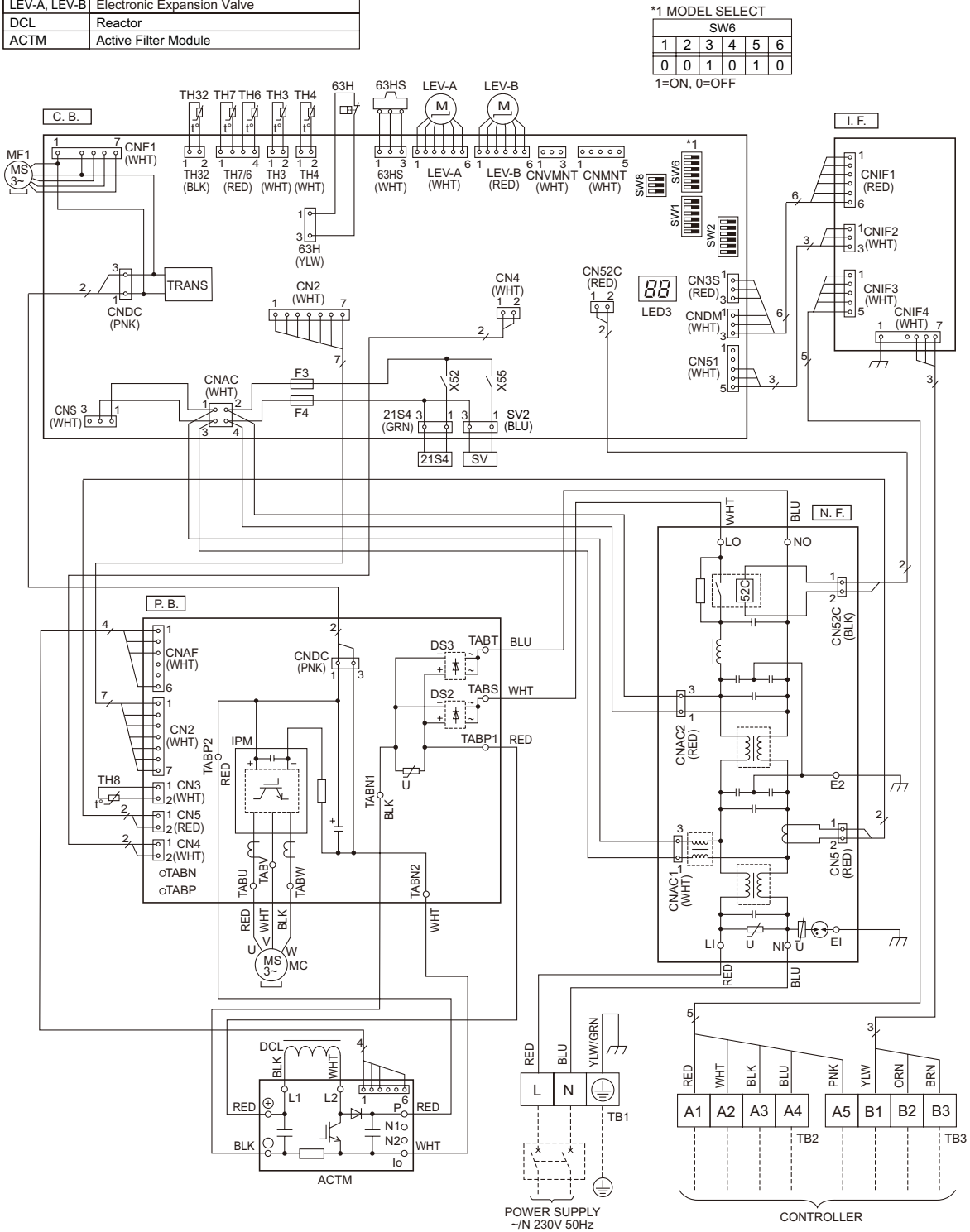
SYMBOL	NAME
P.B.	Power Circuit Board
TABU/V/W	Connection Terminal<U/V/W-Phase>
TABS/T	Connection Terminal<L/N-Phase>
TABP1/P2	Connection Terminal<DC Voltage>
TABN1/N2	Connection Terminal<DC Voltage>
DS2, DS3	Diode bridge
IPM	Power Module
N.F.	Noise Filter Circuit Board
LI,LO	Connection Terminal<L-Phase>
NI,NO	Connection Terminal<N-Phase>
EI,E2	Connection Terminal<Ground>
52C	52C Relay

SYMBOL	NAME
C.B.	Controller Circuit Board
SW1	Switch<Function Switch>
SW2	Switch<Function Switch>
SW6	Switch<Model Select>
SW8	Switch<Function Switch>
LED3	LED<Operation/Inspection Indicators>
F3, F4	Fuse<T6.3AL250V>
X52, X55	Relay
I.F.	Interface Circuit Board

*1 MODEL SELECT

SW6					
1	2	3	4	5	6
0	0	1	0	1	0

1=ON, 0=OFF



6 WIRING SPECIFICATIONS

FIELD ELECTRICAL WIRING (power wiring specifications)

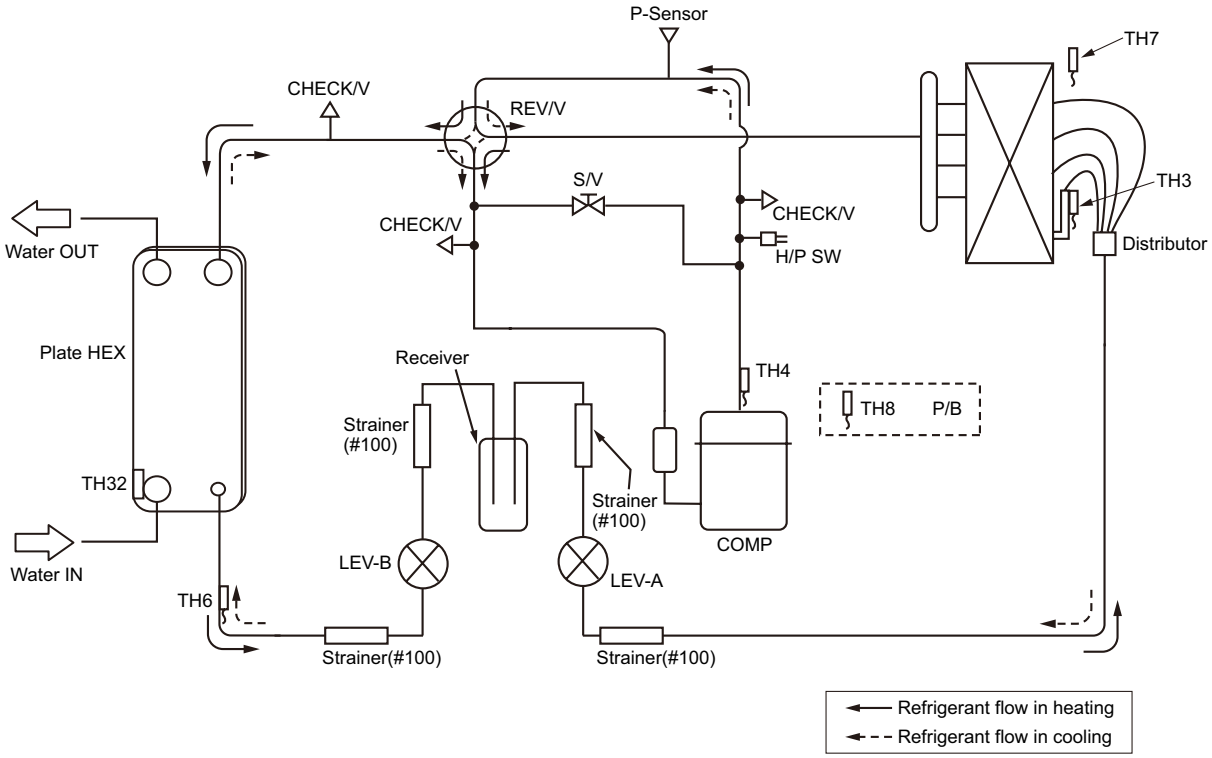
Outdoor unit power supply			~/N (single), 50Hz, 230 V
Outdoor unit Circuit Breaker capacity		*1	25 A
Wiring Wire No. × size (mm^2)	Outdoor unit power supply, earth		3 × Min.4
	Controller-Outdoor unit	*2	8 × Min.0.5 (polar)
Circuit rating	Outdoor unit L-N (single)		AC 230 V
	Controller-Outdoor unit		DC 12 V

*1. A breaker with at least 3.0 mm contact separation in each pole shall be provided. Use non-fuse breaker (NF) or earth leakage breaker (NV).
*2. Max. 20 m

Notes: 1. Wiring size must comply with the applicable local and national codes.
2. Power supply cables and the cables between Controller and Outdoor unit shall not be lighter than polychloroprene sheathed flexible cables.
(Design 60245 IEC 57)
3. Be sure to connect the cables between Controller and Outdoor unit directly to the units (no intermediate connections are allowed).
Intermediate connections may result in communication errors. If water enters at the intermediate connection point, it may cause insufficient
insulation to ground or a poor electrical contact .
(If an intermediate connection is necessary, be sure to take measures to prevent water from entering the cables.)
4. Install an earth longer than other cables.

7 REFRIGERANT SYSTEM DIAGRAM

PUHZ-W90VHA



Symbol	Part name	Detail
COMP	Compressor	DC inverter twin rotary compressor (Mitsubishi Electric Corporation)
H/P SW	High pressure switch (63H)	For protection (OFF:4.15MPa)
Plate HEX	Plate Heat Exchanger	ACH30 - 40 Plates (Alfa Laval)
REV/V	Reversing (4-way) valve (21S4)	Change the refrigerant circuit (Heating / Cooling) and for Defrosting
S/V	Solenoid valve	For production test use
CHECK/V	Check valve	High pressure / Low pressure / For production test use
P-Sensor	Pressure sensor (63HS)	For calculation of the condensing temperature from high pressure
P/B	Power board	Inverter power board
LEV-A	Linear expansion valve -A	Heating:Secondary LEV Cooling:Primary LEV
LEV-B	Linear expansion valve -B	Heating:Primary LEV Cooling:Secondary LEV
TH32	Inlet water temperature thermistor	For freeze protection and for compressor frequency control
TH3	Liquid temperature thermistor	Heating:Evaporating temperature Cooling:Sub cool liquid temperature
TH4	Discharge temperature thermistor	For LEV control and for compressor protection
TH6	Plate HEX liquid temperature thermistor	Heating:Sub cool liquid temperature Cooling:Evaporating temperature
TH7	Ambient temperature thermistor	For fan control and for compressor frequency control
TH8	Heatsink temperature thermistor	For power board protection
Receiver	Receiver	For accumulation of refrigerant

8 TROUBLESHOOTING

8-1. TROUBLESHOOTING

<Error code display by self-diagnosis and actions to be taken for service (summary)>
Present and past error codes are logged and displayed on the control board of outdoor unit. Actions to be taken for service, which depends on whether or not the trouble is reoccurring at service, are summarized in the table below. Check the contents below before investigating details.

Unit conditions at service	Error code	Actions to be taken for service (summary)
The trouble is reoccurring.	Displayed	Judge what is wrong and take a corrective action according to “8-3. Self-diagnosis action table”.
	Not displayed	Conduct troubleshooting and ascertain the cause of the trouble.
The trouble is not reoccurring.	Logged	①Consider the temporary defects such as the work of protection devices in the refrigerant circuit including compressor, poor connection of wiring, noise and etc. Re-check the symptom, and check the installation environment, refrigerant amount, weather when the trouble occurred, matters related to wiring and etc. ②Reset error code logs and restart the unit after finishing service. ③There is no abnormality in electrical component, controller board, and etc.
	Not logged	①Re-check the abnormal symptom. ②Conduct troubleshooting and ascertain the cause of the trouble. ③Continue to operate unit for the time being if the cause is not ascertained. ④There is no abnormality concerning of parts such as electrical component, controller board, and etc.

8-2. CHECK POINT UNDER TEST RUN

Before test run
- After installation of outdoor units, piping work and electric wiring work, re-check that there is no water leakage, loosened connections and incorrect polarity.
- Measure impedance between the ground and the power supply terminal block(L, N) on the outdoor unit by 500V Megger and check that it is 1.0MΩ or over.

※Don’t use 500V Megger to connecting wire terminal block(A1~A5, B1~B3) . This may cause malfunction.
- Turn on power supply 12 hours before test run in order to protect compressor.
- Make sure to read operation manual before test run. (Especially items to secure safety.)

8-3. SELF-DIAGNOSIS ACTION TABLE

<Abnormalities detected when the power is turned on>

Error Code	Abnormal point and detection method	Case	Judgment and action
None	—	① No voltage is supplied to terminal block(TB1) of outdoor unit. a) Power supply breaker is turned off. b) Contact failure or disconnection of power supply terminal c) Open phase (L or N phase)	① Check following items. a) Power supply breaker b) Connection of power supply terminal block. (TB1) c) Connection of power supply terminal block. (TB1)
		② Electric power is not supplied to power supply terminal of noise filter circuit board / outdoor power circuit board. a) Contact failure of power supply terminal b) Open phase on the noise filter circuit board / outdoor power circuit board : Disconnection of terminal LI, NI, LO, NO : Disconnection of terminal TABT or TABS	② Check following items. a) Connection of power supply terminal block. (TB1) Connection of terminal (LI, NI, LO, NO) on the noise filter circuit board b) Connection of terminal (TABT or TABS) on outdoor power circuit board. Refer to 8-6.
		③ Electric power is not supplied to outdoor controller circuit board. a) Connector disconnected (CNDC)	③ Check connection of the CNDC connector, on the outdoor power circuit board. Refer to 8-6.
		④ Disconnection of reactor (DCL)	④ Check connection of reactor. (DCL) Check connection of “L1” and “L2” on the active filter module.(ACTM) Refer to 8-6.
		⑤ Disconnection of outdoor noise filter circuit board or parts failure in outdoor noise filter circuit board	⑤ Replace outdoor noise filter circuit board. Refer to 8-6.
		⑥ Defective outdoor power circuit board	⑥ Replace outdoor power circuit board.
		⑦ Defective outdoor controller circuit board	⑦ Replace outdoor controller circuit board (When items above are checked but the units cannot be repaired.)
F5	**63H connector open** Abnormal if 63H connector circuit is open for 3 minutes continuously from being switched on. 63H: High-pressure switch	① Disconnection or contact failure of 63H connector on outdoor controller circuit board ② Disconnection or contact failure of 63H ③ 63H is working due to defective parts. ④ Defective outdoor controller circuit board	① Check connection of 63H connector on outdoor controller circuit board. Refer to 8-6. ② Check the 63H side of connecting wire. ③ Check for continuity of 63H. Replace high pressure swich if it is defective. ④ Replace outdoor controller circuit board.

<Abnormalities detected while unit is operating>

Error Code	Abnormal point and detection method	Case	Judgment and action
U1	**High pressure (High-pressure switch 63H activated)** Abnormal if high-pressure switch 63H is activated (※) during compressor operation. ※ 4.15 MPa 63H: High-pressure switch	① Decreased water flow ② Clogged filter of water pipe ③ Dirt of plate heat exchanger ④ Locked water pump ⑤ Malfunction of water pump ⑥ Clogged or broken pipe ⑦ Locked outdoor fan motor ⑧ Malfunction of outdoor fan motor ⑨ Short cycle of outdoor unit ⑩ Dirt of outdoor heat exchanger ⑪ Decreased airflow caused by defective inspection of outside temperature thermistor (It detects lower temperature than actual temperature.) ⑫ Disconnection or contact failure of connector (63H) on outdoor controller board ⑬ Disconnection or contact failure of 63H connection ⑭ Defective outdoor controller board ⑮ Defective operation of linear expansion valve ⑯ Malfunction of fan driving circuit	①~⑤Check water circuit and repair the defect. ⑥ Check piping and repair the defect. ⑦~⑩ Check outdoor unit and repair the defect. ⑪ Check the detected temperature of outside temperature thermistor on LED display. (SW2: Refer to 8-7.) ⑫~⑭Turn the power off and check F5 is displayed when the power is turned on again. When F5 is displayed, refer to “Judgment and action” for F5. ⑮ Check linear expansion valve. Refer to 8-5. ⑯ Replace outdoor controller board.
U2	**High discharging temperature** (1) Abnormal if discharge temperature thermistor (TH4) detects 125℃ or 110℃ continuously for 5 minutes. Abnormal if during defrosting and discharge temperature thermistor (TH4) detects 110℃ continuously for 30 minutes.	① Overheated compressor operation caused by insufficient refrigerant ② Defective thermistor ③ Defective outdoor controller board ④ Defective operation of linear expansion valve	① Check intake super heat. Check leakage of refrigerant. Charge additional refrigerant. ②③Turn the power off and check if U3 is displayed when the power is turned ON again. When U3 is displayed, refer to “Judgement and action” for U3. ④ Check linear expansion valve. Refer to 8-5.
U3	**Open/short circuit of discharge temperature thermistor (TH4)** Abnormal if open (3℃ or less) or short (217℃ or more) is detected during compressor operation. (Detection is inoperative for 10 seconds to 10 minutes of compressor starting process and for 10 minutes after or during defrosting.)	① Disconnection or contact failure of connector (TH4) on the outdoor controller circuit board. ② Defective thermistor ③ Defective outdoor controller circuit board	① Check connection of connector (TH4) on the outdoor controller circuit board. Check the lead wire for thermistor (TH4). Refer to 8-6. ② Check resistance value of thermistor (TH4) or temperature on LED display. (Thermistor/TH4: Refer to 8-5.) (SW2 : Refer to 8-7.) ③ Replace outdoor controller board.

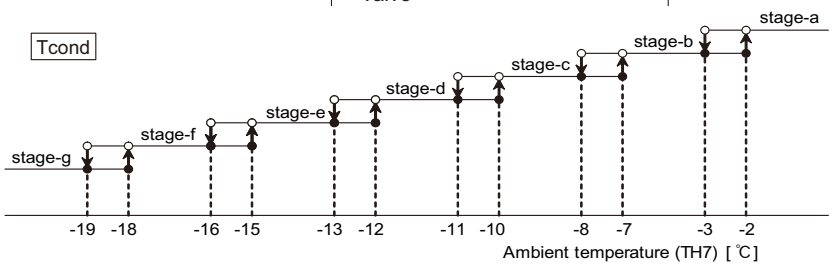
Error Code	Abnormal point and detection method	Case	Judgment and action
U4	**Open/short of outdoor unit thermistors (TH3, TH32, TH6, TH7, and TH8)** Abnormal if open or short is detected during compressor operation. Open detection of thermistors TH3, TH32 and TH6 is not detected for 10 seconds to 10 minutes after compressor starting and 10 minutes after and during defrosting. ※Check which unit has abnormality in its thermistor by switching the mode of SW2. (Refer to 8-7.)	① Disconnection or contact failure of connectors (Outdoor controller circuit board: TH3,TH32,TH6/TH7 Outdoor power circuit board: CN3) ② Defective thermistor ③ Defective outdoor controller circuit board	① Check connection of connector (TH3,TH32, TH6/TH7) on the outdoor controller circuit board. Check connection of connector (CN3) on the outdoor power circuit board. Check the lead wire for thermistor (TH3,TH32,TH6,TH7,TH8). Refer to 8-6. ② Check resistance value of thermistor (TH3,TH32,TH6,TH7,TH8) or check temperature on LED display. (Thermistor/TH3,TH32,TH6,TH7,TH8: Refer to 8-5.) (SW2 : Refer to 8-7) ③ Replace outdoor controller circuit board.
U5	**Temperature of heatsink** Abnormal if heatsink thermistor(TH8) detects temperature indicated 77℃.	① The outdoor fan motor is locked. ② Failure of outdoor fan motor ③ Air flow path is clogged. ④ Ambient temperature is high. ⑤ Defective thermistor ⑥ Defective input circuit of outdoor power circuit board ⑦ Failure of outdoor fan drive circuit	①② Check outdoor fan. ③ Check air flow path for cooling. ④ Check if there is something which causes temperature rise around outdoor unit. (Upper limit of ambient temperature is 46℃.) Turn off power, and on again to check if U5 is displayed within 30 minutes. If U4 is displayed instead of U5, refer to error code U4. ⑤ Check resistance value of thermistor (TH8) or temperature by microcomputer. (Thermistor/TH8: Refer to 8-5.) (SW2 : Refer to 8-6) ⑥ Replace outdoor power circuit board. ⑦ Replace outdoor controller circuit board.
U6	**Power module** Check abnormality by driving power module in case overcurrent is detected. (UF or UP error condition)	① Defective outdoor power circuit board ② Decrease of power supply voltage ③ Loosen, disconnected or reverse of compressor wiring connection ④ Defective compressor	① Replace outdoor power circuit board. ② Check facility of power supply. ③ Correct the wiring (U·V·W phase) to compressor. Refer to 8-6 (Outdoor power circuit board). ④ Check compressor referring to 8-4.

Thermistors		Open detection	Short detection
Symbol	Name		
TH3	Thermistor <Liquid temperature>	– 40℃ or below	90℃ or above
TH32	Thermistor <Inlet water temperature>	– 40℃ or below	102℃ or above
TH6	Thermistor <Plate HEX liquid temperature>	– 40℃ or below	90℃ or above
TH7	Thermistor <Ambient temperature>	– 40℃ or below	90℃ or above
TH8	Thermistor <Heatsink temperature>	– 35℃ or below	102℃ or above

Error Code	Abnormal point and detection method	Case	Judgment and action
U7	**Too low superheat due to low discharge temperature** Abnormal if discharge superheat is continuously detected -15℃ or less for 3 minutes even though linear expansion valve has minimum open pulse after compressor starts operating for 10 minutes.	① Disconnection or loose connection of discharge temperature thermistor (TH4) ② Defective holder of discharge temperature thermistor ③ Disconnection or loose connection of linear expansion valve's coil ④ Disconnection or loose connection of linear expansion valve's connector ⑤ Defective linear expansion valve	①② Check the installation conditions of discharge temperature thermistor (TH4). ③ Check the coil of linear expansion valve. Refer to 8-5. ④ Check the connection or contact of LEV-A and LEV-B on outdoor controller circuit board. ⑤ Check linear expansion valve. Refer to 8-4.
U8	**Outdoor fan motor** The outdoor fan motor is considered to be abnormal if the rotational frequency of fan motor is abnormal when detected during operation. Fan motor rotational frequency is abnormal if; • 100 rpm or below detected continuously for 15 seconds at 20℃ or more outside air temperature • 50 rpm or below or 1500 rpm or more detected continuously for 1 minute.	① Failure in the operation of the DC fan motor ② Failure in the outdoor circuit controller board	① Check or replace the DC fan motor. ② Check the voltage of the outdoor circuit controller board during operation. ③ Replace the outdoor circuit controller board. (when the failure is still indicated even after performing the remedy ① above.)
U9	**Overvoltage or voltage shortage Synchronous signal to main circuit** Abnormal if any of followings are detected during compressor operation; • Decrease of DC bus voltage to 310V • Instantaneous decrease of DC bus voltage to 200V • Increase of DC bus voltage to 400V • Decrease of input current of outdoor unit to 0.1A only if operation frequency is more than or equal to 40Hz or compressor current is more than or equal to 6A. ※ Check U9 error detail (SW2 all ON) Refer to 8-7.	① Decrease of power supply voltage ② Disconnection of compressor wiring ③ Disconnection or loose connection of CN52C ④ Defective ACT module ⑤ Defective ACT module drive circuit of outdoor power circuit board ⑥ Disconnection or loose connection of CNAF ⑦ Defective 52C drive circuit of outdoor controller circuit board ⑧ Disconnection or loose connection of CN5 on the outdoor power circuit board ⑨ Defective input current circuit of outdoor power circuit board/ noise filter circuit board	① Check the facility of power supply. ② Correct the wiring (U·V·W phase) to compressor. Refer to 8-6 (Outdoor power circuit board). ③ Check CN52C wiring. ④ Replace ACT module. ⑤ Replace outdoor power circuit board. ⑥ Check CNAF wiring. ⑦ Replace outdoor controller circuit board. ⑧ Check CN5 wiring on the outdoor power circuit board. Refer to 8-6. ⑨ Replace outdoor power circuit board/ noise filter circuit board.
Ud	**Overheat protection** Abnormal if outdoor pipe thermistor (TH3) detects 70℃ or more or condensing temperature of pressure sensor (63HS) detects 70℃ or more during compressor operation.	① Defective outdoor fan (fan motor) or short cycle of outdoor unit during cooling operation ② Defective outdoor pipe thermistor (TH3) ③ Defective outdoor controller board ④ Defective pressure sensor	① Check outdoor unit air passage. ②③ Turn the power off and on again to check the error code. If U4 is displayed, follow the U4 processing direction. ④ Check pressure by microcomputer. (Pressure sensor/ 63HS) (SW2: Refer to 8-7.)
UF	**Compressor overcurrent interruption (When compressor locked)** Abnormal if overcurrent of DC bus or compressor is detected within 30 seconds after compressor starts operating.	① Decrease of power supply voltage ② Looseness, disconnection or converse of compressor wiring connection ③ Defective compressor ④ Defective outdoor power board ⑤ Decreased water flow ⑥ Clogged filter of water pipe ⑦ Clogged plate heat exchanger ⑧ Locked water pump ⑨ Malfunction of water pump	① Check facility of power supply. ② Correct the wiring (U·V·W phase) to compressor. Refer to 8-6 (Outdoor power circuit board). ③ Check compressor. Refer to 8-4. ④ Replace outdoor power circuit board. ⑤~⑨Check water circuit and repair the defect.

Error Code	Abnormal point and detection method	Case	Judgment and action
UH	**Current sensor error or input current error** ·Abnormal if current sensor detects –1.0A to 1.0A during compressor operation. (This error is ignored during test run.) ·Abnormal if input current is detected 32A or input current is detected 28A or more for 10 seconds continuously.	① Disconnection of compresso wiring ② Defective circuit of current sensor on outdoor power circuit board ③ Decrease of power supply voltage	① Correct the wiring (U·V·W phase) to compressor. Refer to 8-6 (Outdoor power circuit board). ② Replace outdoor power circuit board. ③ Check the facility of power supply.
UP	**Compressor overcurrent interruption** Abnormal if overcurrent DC bus or compressor is detected after compressor starts operating for 30 seconds.	① Decrease of power supply voltage ② Looseness, disconnection or converse of compressor wiring connection ③ Defective fan of outdoor units ④ Short cycle of indoor/outdoor units ⑤ Defective input circuit of outdoor controller board ⑥ Defective compressor ⑦ Decreased water flow ⑧ Clogged filter of water pipe ⑨ Clogged plate heat exchanger ⑩ Locked water pump ⑪ Malfunction of water pump	① Check facility of power supply. ② Correct the wiring (U·V·W phase) to compressor. Refer to 8-6 (Outdoor power circuit board). ③ Check outdoor fan. ④ Solve short cycle. ⑤ Replace outdoor controller circuit board. ⑥ Check compressor. Refer to 8-4. ※ Before the replacement of the outdoor controller circuit board, disconnect the wiring to compressor from the outdoor power circuit board and check the output voltage among phases, U, V, W, during test run. No defect on board if voltage among phases (U-V, V-W and W-U) is same. Make sure to perform the voltage check with same performing frequency. ⑦~⑪ Check water circuit and repair the defect.
Ed	**Serial communication error** Abnormal if serial communication between outdoor controller circuit board and outdoor power circuit board is defective.	① Wire disconnection or contact failure of connector CN2 between the outdoor controller circuit board and the outdoor power circuit board ② Wire disconnection or contact failure of connector CN4 between the outdoor controller circuit board and the outdoor power circuit board ③ Defective communication circuit of outdoor power circuit board ④ Defective communication circuit of outdoor controller circuit board for outdoor power circuit board	①② Check connection of each connector CN2 and CN4 between the outdoor controller circuit board and the outdoor power circuit board. ③ Replace outdoor power circuit board. ④ Replace outdoor controller circuit board.

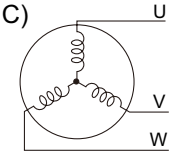
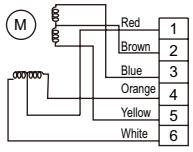
Error Code	Abnormal point and detection method	Case	Judgment and action
P6	**Freezing/overheating protection is working** (1)Freezing protection <Cooling mode> Abnormal if plate heat exchanger pipe temperature(TH6) stays at -5℃ or lower for 10 seconds or abnormal if plate heat exchanger pipe thermistor (TH6) stays at -2℃ or lower and compressor operation frequency is minimum for 5 minutes after compressor starts operating for 6 minutes. (2)Overheating protection <Heating mode> Abnormal if condensing temperature of pressure sensor(63HS) detects Tcond. ℃ or more and compressor operation frequency is less than or equal to 30 Hz. Detection is inoperative during defrosting.	<Cooling mode> ① Reduced water flow · Clogged filter · Leakage of water ② Low temperature · Low-load · Inlet water is too cold. ③ Defective water pump ④Defective outdoor fan control ⑤Overcharge of refrigerant ⑥Defective refrigerant circuit (clogs) ⑦Malfunction of linear expansion valve <Heating mode> ① Reduced water flow · Clogged filter · Leakage of water ② High temperature · Over-load · Inlet water is too warm. ③ Defective water pump ④ Overcharge of refrigerant ⑤ Defective refrigerant circuit (clogs) ⑥ Malfunction of linear expansion valve	<Cooling mode> ①② Check water piping. ③ Check water pump. ④ Check outdoor fan motor. ⑤~⑦ Check operating condition of refrigerant circuit. ⑦ Check linear expansion valve. <Heating mode> ①② Check water piping. ③ Check water pump. ④⑤ Check operating condition of refrigerant circuit. ⑥ Check linear expansion valve.
P8	**Pipe temperature** Abnormal if the following conditions are detected for continuously 3 minutes after compressor starts operating for 10 minutes. 1.Cooling mode T_{63HS}-TH7≦2℃ and TH3-TH7≦4℃ or T_{63HS}-TH3< 0℃ and TH32-TH6≦0℃ and Compressor operation frequency is 61Hz or more. 2.Heating mode T_{63HS}-TH32≦2℃ and TH6-TH32≦1℃ and TH7-TH3≦1℃ and Compressor operation frequency is 61Hz or more. T_{63HS}:Condensing temperature of pressure sensor(63HS) Thermistor TH3:Liquid temperature TH32:Inlet water temperature TH6:Plate HEX Liquid temperature TH7:Ambient temperature	① Leakage or shortage of refrigerant ② Malfunction of linear expansion valve ③ Refrigerant circuit is clogged with foreign objects. ※ Clogging occurs in the parts which become below freezing point when water enters in refrigerant circuit. ④ Disconnection holder of thermistor	① Check intake superheat. Check leakage of refrigerant. ② Check linear expansion valve. ③ After recovering refrigerant, remove water from entire refrigerant circuit under vacuum more than 1 hour. ④ Check temperature display on outdoor controller circuit board. Temperature display is indicated by setting SW2 of outdoor controller circuit board. Check the holder of thermistor.
UE	**Abnormal pressure of pressure sensor (63HS)** Abnormal if pressure sensor(63HS) detects 0.1MPa or less. Detection is inoperative for 3 minutes after compressor starting and 3minutes after and during defrosting.	① Disconnection or contact failure of connector (63HS) on the outdoor controller circuit board ② Defective pressure sensor ③ Defective outdoor controller circuit board	① Check connection of connector (63HS) on the outdoor controller circuit board. Check breaking of the lead wire for thermistor (63HS). ② Check pressure by microcomputer. (Pressure sensor/ 63HS) (SW2: Refer to 8-7.) ③ Replace outdoor controller board.



	stage-a	stage-b	stage-c	stage-d	stage-e	stage-f	stage-g
Tcond	63	61	59	57	54	51	48

Error Code	Abnormal point and detection method	Case	Judgment and action
PE	**Inlet water temperature** Abnormal if the following conditions are detected for continuously 10 seconds. 1.Cooling mode During compressor operation TH32 < 3℃ 2.Heating mode (exclude defrosting) During compressor operation TH32 < -10℃ 3.Defrosting mode During compressor operation TH32 < 0℃ Thermistor TH32 : Inlet water temperature	① Reduced water flow · Clogged filter · Leak of water ② Low temperature · Low-load · Low temperature inlet water ③ Defective water pump ④ Leakage or shortage of refrigerant	①② Check water piping. ③ Check water pump. ④ Check intake superheat. Check leakage of refrigerant.

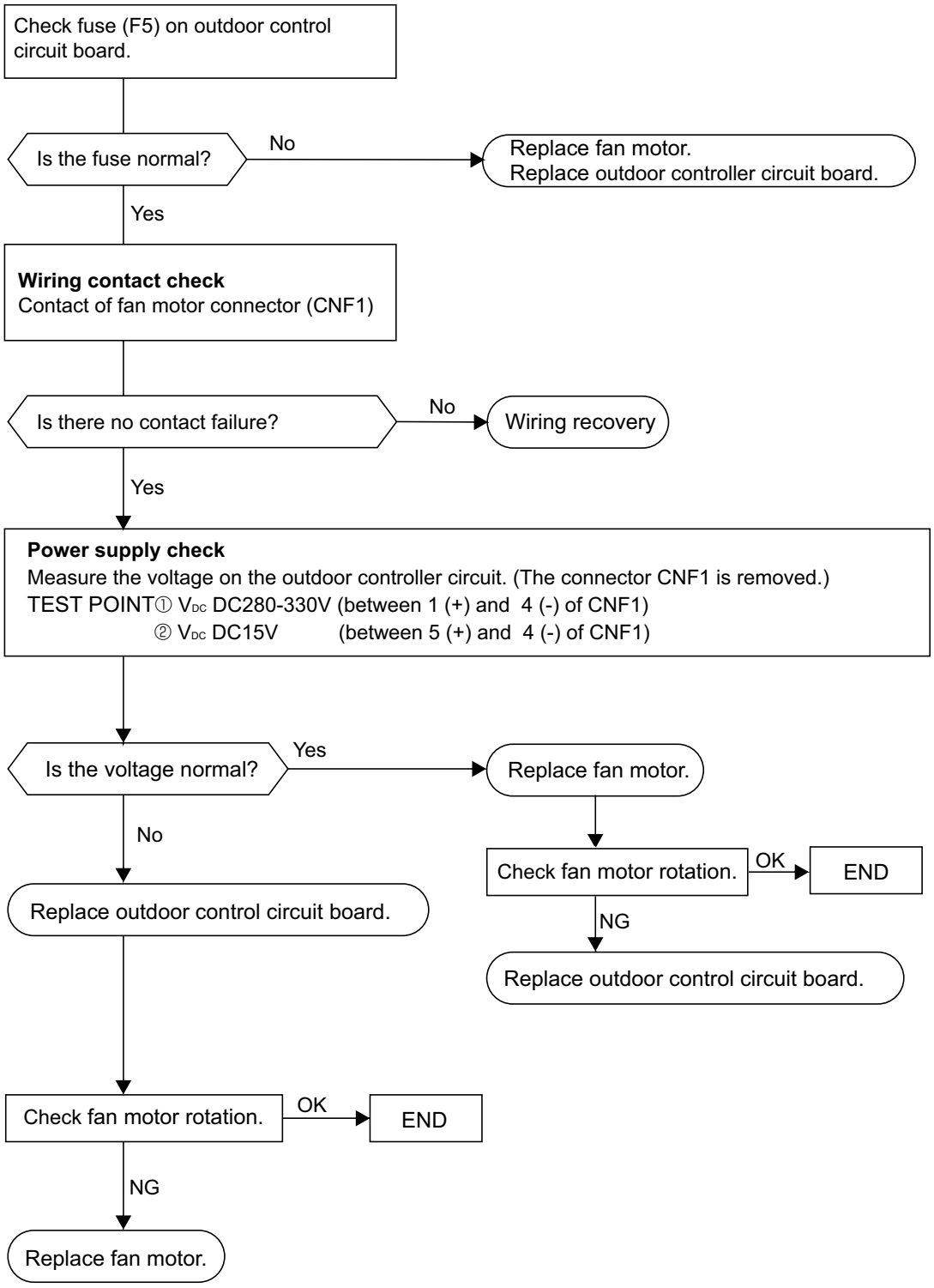
8-4. HOW TO CHECK THE PARTS
PUHZ-W90VHA

<table>
<tr><th>Parts name</th><th>Check points</th></tr>
<tr><td>TH3:Liquid pipe temperature
TH4:Discharge temperature
TH6:Plate Hex liquid pipe temperature
TH7:Ambient temperature
TH8:Heatsink temperature
TH32:Inlet water temperature</td><td>Disconnect the connector then measure the resistance using a tester.
(At the ambient temperature of 10℃~30℃)
<table>
<tr><th></th><th>Normal</th><th>Abnormal</th></tr>
<tr><td>TH4</td><td>160kΩ~410kΩ</td><td rowspan="5">Open or short</td></tr>
<tr><td>TH3
TH6
TH7</td><td>4.3kΩ~9.6kΩ</td></tr>
<tr><td>TH32</td><td>4.4kΩ~9.8kΩ</td></tr>
<tr><td>TH8</td><td>39kΩ~105kΩ</td></tr>
</table></td></tr>
<tr><td>Fan motor(MF1)</td><td>Refer to the next page.</td></tr>
<tr><td>Solenoid valve coil
<Four-way valve>
(21S4)</td><td>Measure the resistance between the terminals using a tester.
(At the ambient temperature of 20℃)
<table>
<tr><th>Normal</th><th>Abnormal</th></tr>
<tr><td>2350±170Ω</td><td>Open or short</td></tr>
</table></td></tr>
<tr><td>Compressor
(MC)
 
</td><td>Measure the resistance between the terminals using a tester.
(Winding temperature 20℃)
<table>
<tr><th>Normal</th><th>Abnormal</th></tr>
<tr><td>0.865Ω~0.895Ω</td><td>Open or short</td></tr>
</table></td></tr>
<tr><td>Linear expansion valve
(LEV-A/ LEV-B)
 
</td><td>Disconnect the connector then measure the resistance using a tester.
(Winding temperature 20℃)
<table>
<tr><th colspan="4">Normal</th><th>Abnormal</th></tr>
<tr><td>Red - White</td><td>Red - Orange</td><td>Brown - Yellow</td><td>Brown - Blue</td><td rowspan="2">Open or short</td></tr>
<tr><td colspan="4">46±4Ω</td></tr>
</table></td></tr>
<tr><td>Solenoid valve coil
<Bypass valve>
(SV)</td><td>Measure the resistance between the terminals using a tester.
(At the ambient temperature of 20℃)
<table>
<tr><th>Normal</th><th>Abnormal</th></tr>
<tr><td>1450±150Ω</td><td>Open or short</td></tr>
</table></td></tr>
</table>

Check method of DC fan motor (fan motor / outdoor controller circuit board)

① Notes
- · High voltage is applied to the connector (CNF1) for the fan motor. Give attention to the service.
- · Do not pull out the connector (CNF1) of the motor with the power supply on.
  (It may damage of the outdoor controller circuit board and fan motor.)

② Self check
Symptom : The outdoor fan does not run.



8-5. HOW TO CHECK THE COMPONENTS

<Thermistor feature chart>

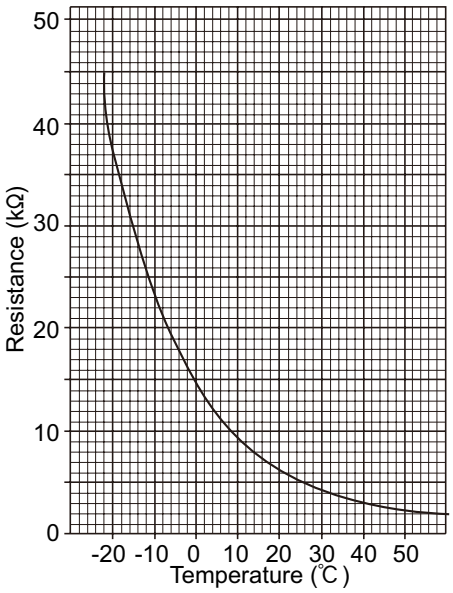
Low temperature thermistors

- Thermistor <Liquid pipe> (TH3)
- Thermistor <Plate Hex liquid pipe> (TH6)
- Thermistor <Ambient> (TH7)

Thermistor R0 = 15kΩ ± 3%
B constant = 3480 ± 2%

$$R_t = 15\exp\{3480(\frac{1}{273+t} - \frac{1}{273})\}$$

0℃	15kΩ	30℃	4.3kΩ
10℃	9.6kΩ	40℃	3.0kΩ
20℃	6.3kΩ		
25℃	5.2kΩ		



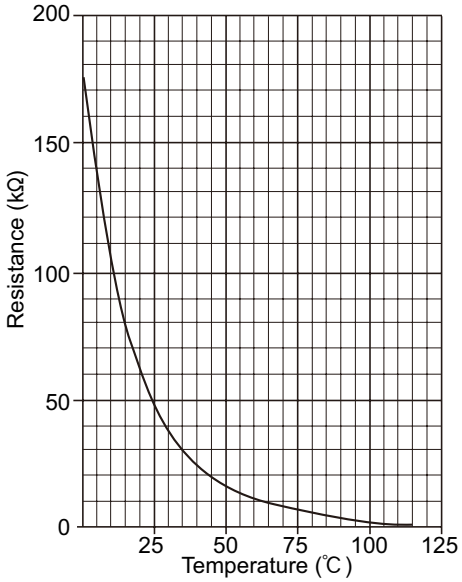
Medium temperature thermistor

- Thermistor <Heatsink> (TH8)

Thermistor R50 = 17kΩ ± 2%
B constant = 4150 ± 3%

$$R_t = 17\exp\{4150(\frac{1}{273+t} - \frac{1}{323})\}$$

0℃	180kΩ
25℃	50kΩ
50℃	17kΩ
70℃	8kΩ
90℃	4kΩ



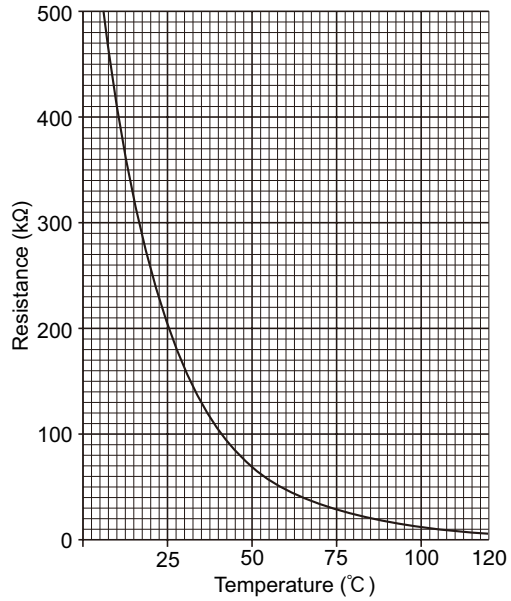
High temperature thermistor

- Thermistor <Discharge pipe> (TH4)

Thermistor R120 = 7.465kΩ ± 2%
B constant = 4057 ± 2%

$$R_t = 7.465\exp\{4057(\frac{1}{273+t} - \frac{1}{393})\}$$

20℃	250kΩ	70℃	34kΩ
30℃	160kΩ	80℃	24kΩ
40℃	104kΩ	90℃	17.5kΩ
50℃	70kΩ	100℃	13.0kΩ
60℃	48kΩ	110℃	9.8kΩ



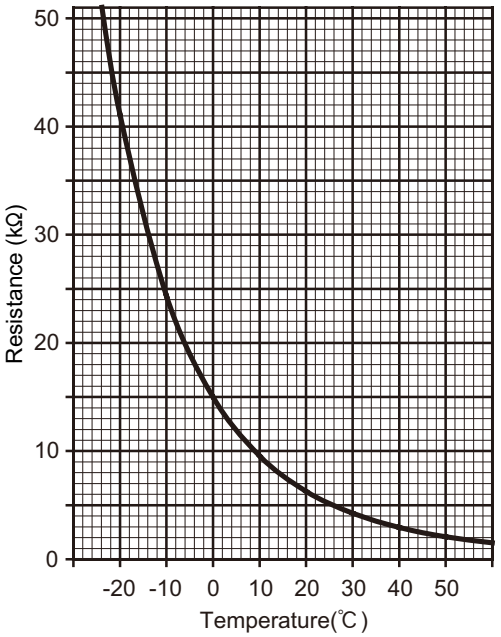
Low temperature thermistor

• Thermistor <Inlet water> (TH32)

Thermistor R0 = 15kΩ ± 2.5%
B constant = 3450 ± 2%

$$R_t = 15\exp\{3450\left(\frac{1}{273+t} - \frac{1}{273}\right)\}$$

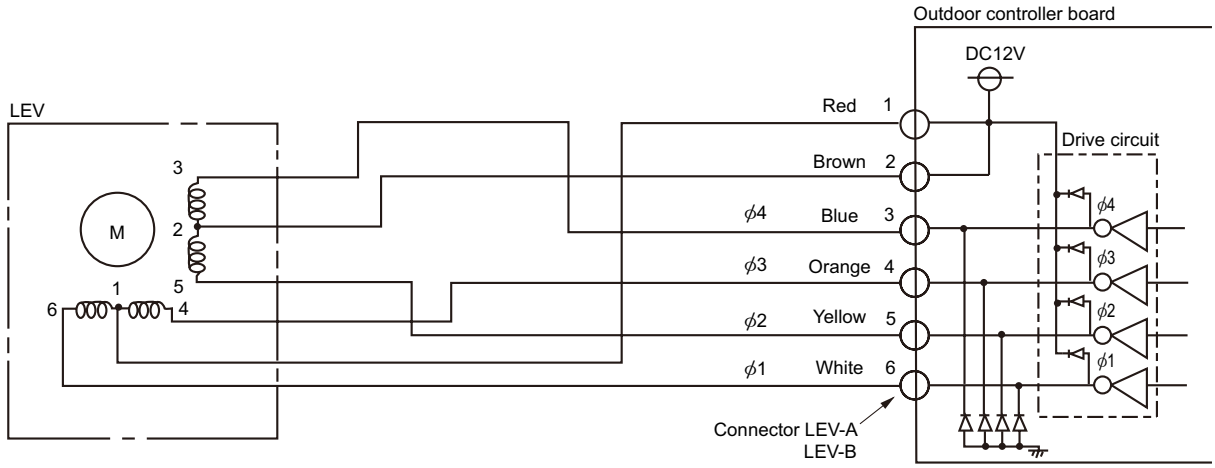
0℃	15kΩ	30℃	4.2kΩ
10℃	9.6kΩ	40℃	2.9kΩ
20℃	6.3kΩ		
25℃	5.1kΩ		



Linear expansion valve

(1) Operation summary of the linear expansion valve

• Linear expansion valve open/close through stepping motor after receiving the pulse signal from the outdoor controller board.
• Valve position can be changed in proportion to the number of pulse signal.
<Connection between the indoor controller board and the linear expansion valve>



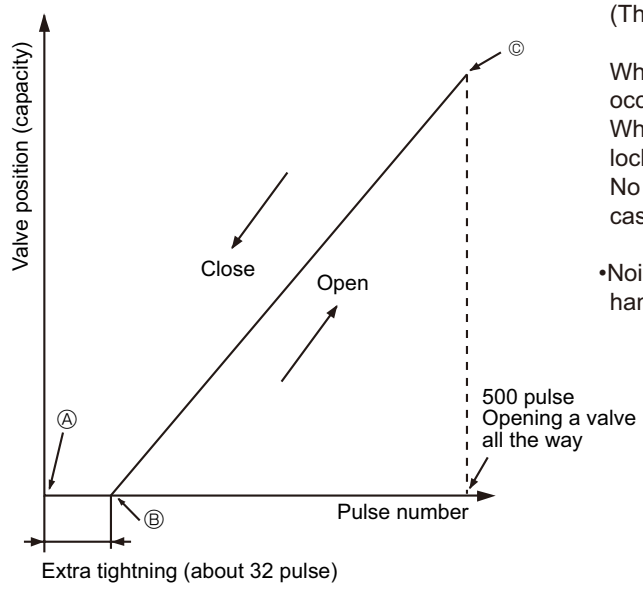
<Output pulse signal and the valve operation>

Output (Phase)	Output							
	1	2	3	4	5	6	7	8
ϕ1	ON	ON	OFF	OFF	OFF	OFF	OFF	ON
ϕ2	OFF	ON	ON	ON	OFF	OFF	OFF	OFF
ϕ3	OFF	OFF	OFF	ON	ON	ON	OFF	OFF
ϕ4	OFF	OFF	OFF	OFF	OFF	ON	ON	ON

Opening a valve : 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1 → 8
Closing a valve : 1 → 2 → 3 → 4 → 5 → 6 → 7 → 8 → 1

The output pulse shifts in above order.
•When linear expansion valve operation stops, all output phase become OFF.

(2) Linear expansion valve operation



•When the switch is turned on, 700 pulse closing valve signal will be sent till it goes to Ⓐ point in order to define the valve position. (The pulse signal is being sent for about 20 seconds.)

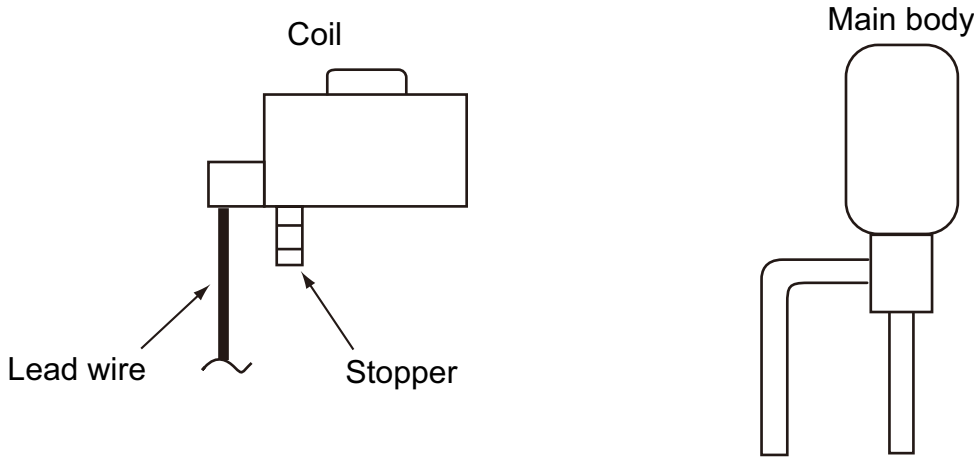
When the valve moves smoothly, there is no sound or vibration occurring from the linear expansion valve.
When the pulse number moves from Ⓑ to Ⓐ or when the valve is locked, sound can be heard.
No sound is heard when the pulse number moves from Ⓑ to Ⓐ in case coil is burnt out or motor is locked by open-phase.

•Noise can be detected by placing the ear against the screw driver handle while putting the screw driver to the linear expansion valve.

(3) How to attach and detach the coil of linear expansion valve

<Composition>

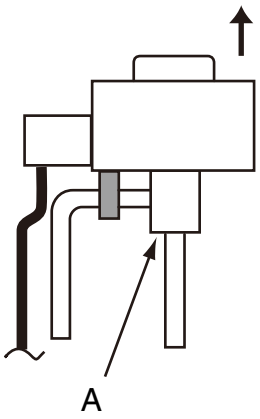
Linear expansion valve is separable into the main body and the coil as shown in the diagram below.



<How to detach the coil>

Hold the lower part of the main body (shown as A) firmly so that the main body does not move and detach the coil by pulling it upward.

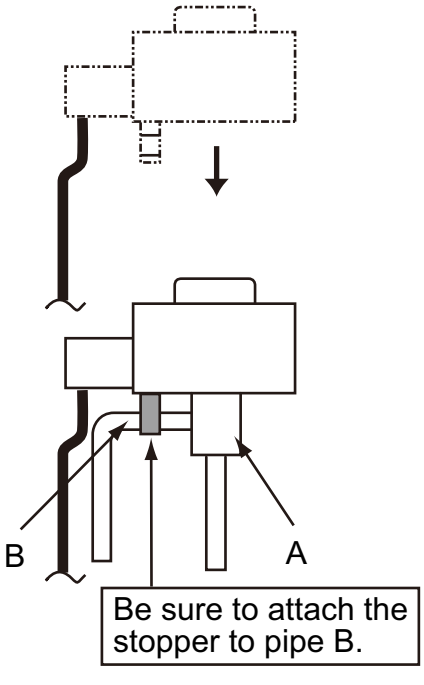
Be sure to detach the coil holding main body firmly. Otherwise, pipes can bend due to pressure.



<How to attach the coil>

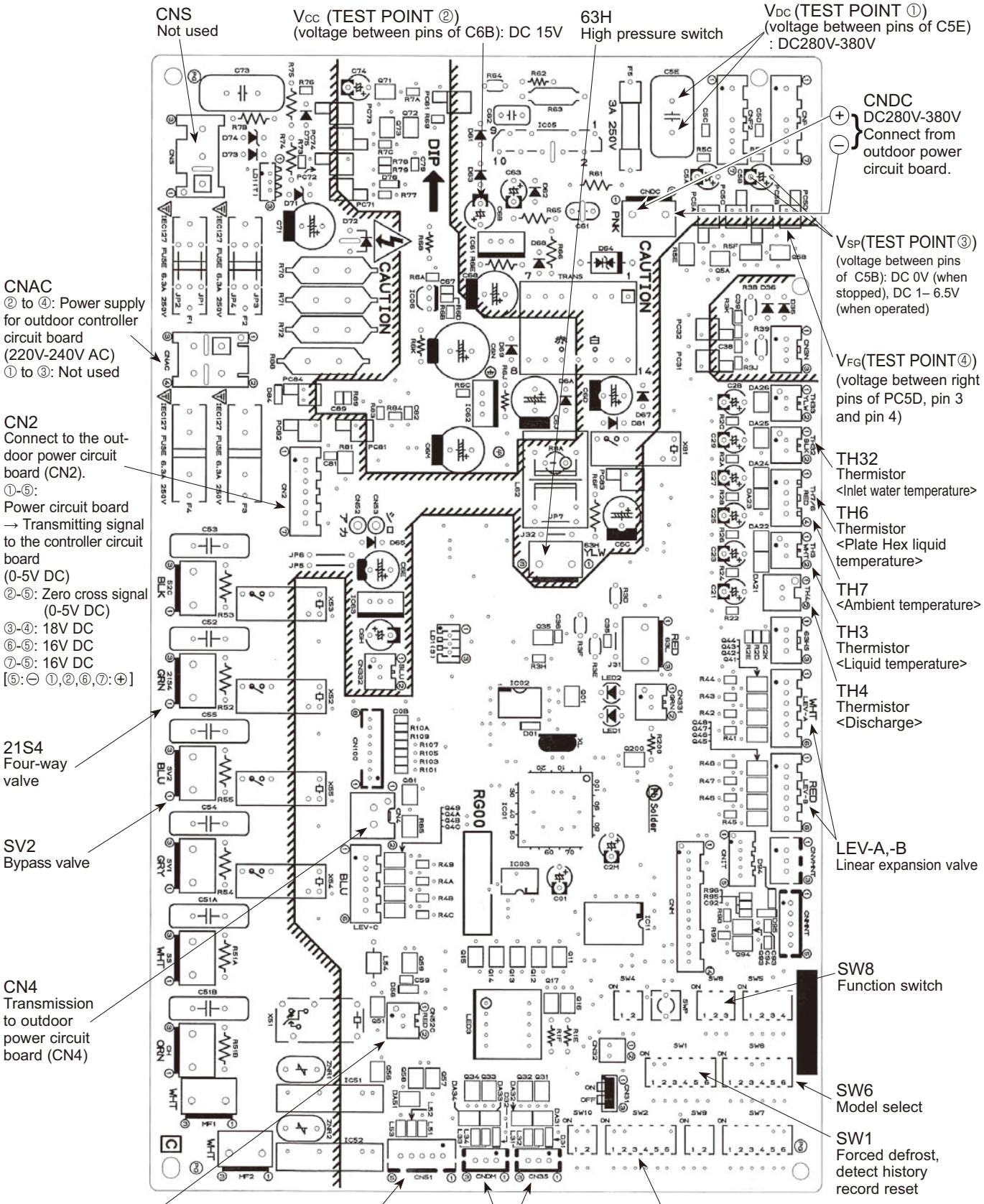
Hold the lower part of the main body (shown as A) firmly so that the main body does not move and attach the coil by inserting it downward into the main body. Then securely attach the coil stopper to pipe B. (At this time, be careful that stress is not added to lead wire and main body is not wounded by lead wire.) If the stopper is not firmly attached to pipe B, coil may be detached from the main body and that can cause defective operation of linear expansion valve.

To prevent piping stress, be sure to attach the coil holding the main body of linear expansion valve firmly. Otherwise pipe may break.

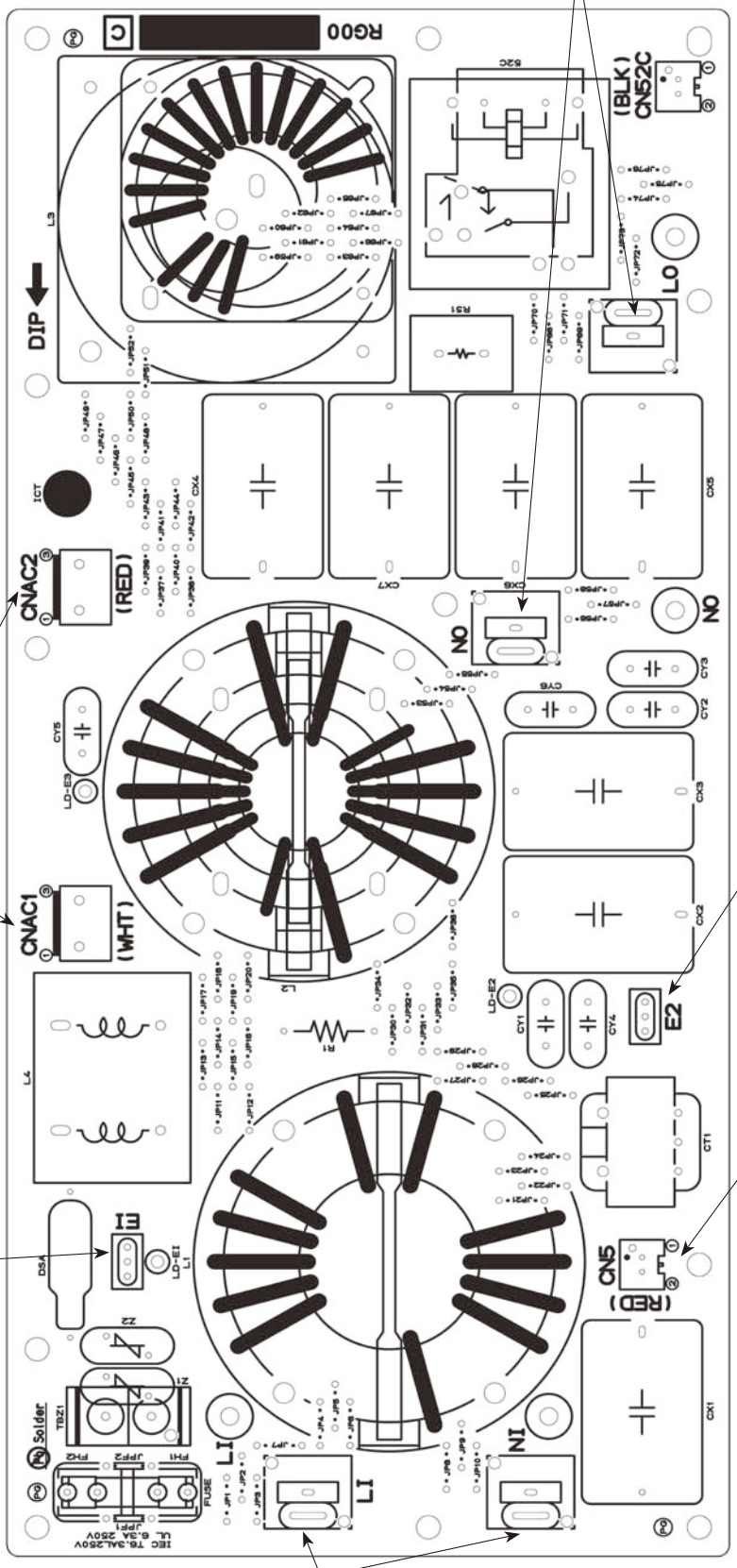


8-6. TEST POINT DIAGRAM
Outdoor controller circuit board

<CAUTION> TEST POINT① is high voltage.



Outdoor noise filter circuit board



Outdoor power circuit board

Brief Check of POWER MODULE
※ Usually, they are in a state of being short-circuited if they are broken.
Measure the resistance in the following points (connectors, etc.).
If they are short-circuited, it means that they are broken.
1. Check of diode bridge
   TABP1-TABS, TABN1-TABS, TABP1-TABT,TABN1-TABT
2. Check of DIP-IPM
   P-U, P-V, P-W, N-U, N-V, N-W

CN2
Connect to the outdoor controller circuit board (CN2)
1-5:Transmitting signal to the outdoor controller circuit board (0~5V DC)
2-5:Zero cross signal (0~5V DC)
3,4:18V DC
6-5:16V DC
7-5:16V DC

CNAF
Connect to ACTM

DIP-IPM

CNDC
280-380V DC (①+, ③–)
Connect to the outdoor controller circuit board

TABS/TABT
Connect to the outdoor noise filter circuit board
Voltage among phases:220-240V AC

CN3
Thermistor (TH8)
<Heatsink>

CN5
Detection of input current
Connect to the outdoor noise filter circuit board (CN5)

CN4
Connect to the outdoor controller circuit board (CN4)

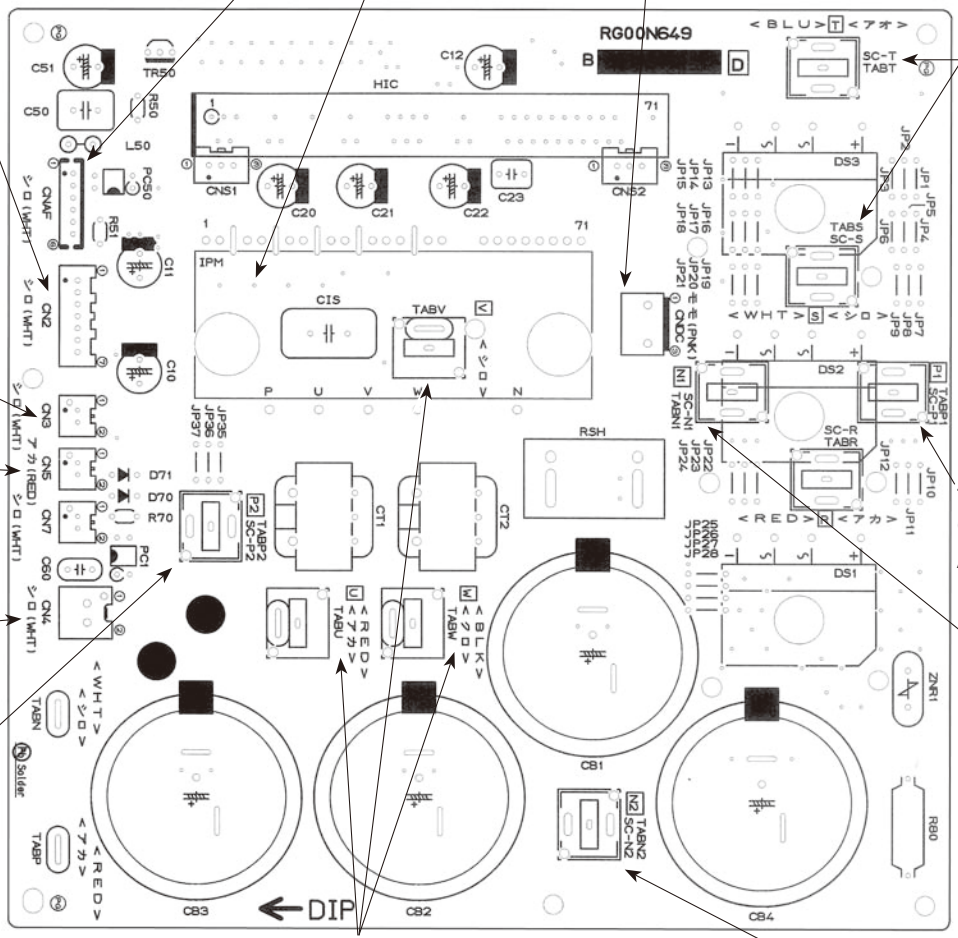
TABP2
Connect to the ACTM

TABP1
Connect to ACTM⊕

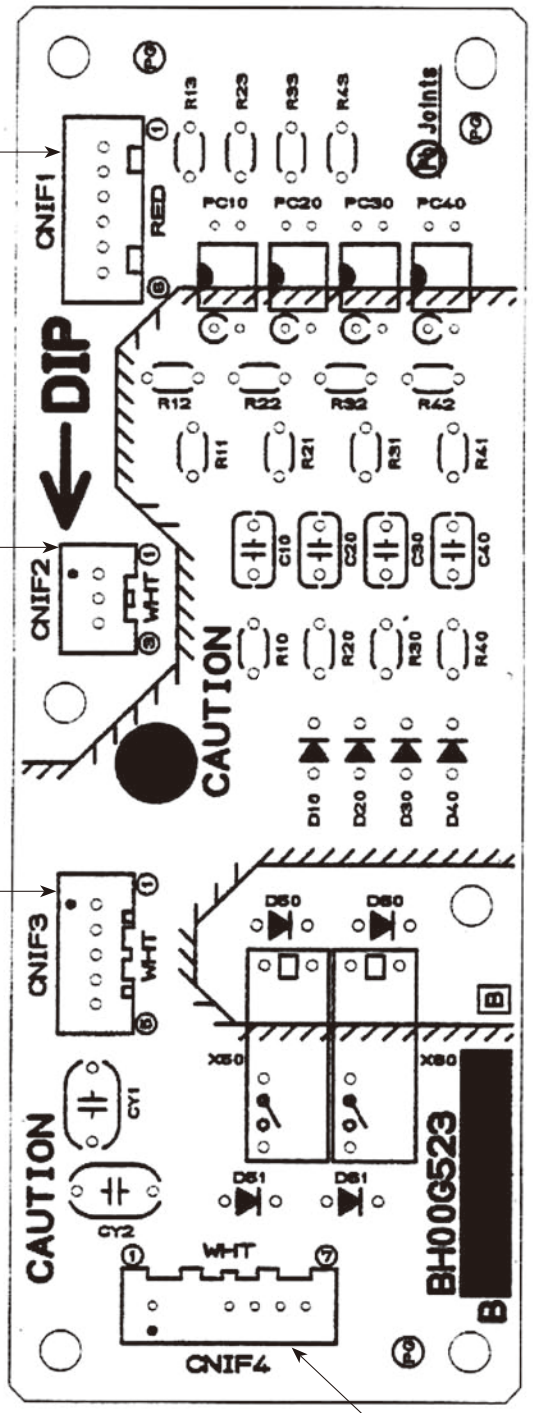
TABN1
Connect to ACTM⊖

TABU/V/W
Connect to the compressor (MC)
Voltage among phases:10V~180V AC

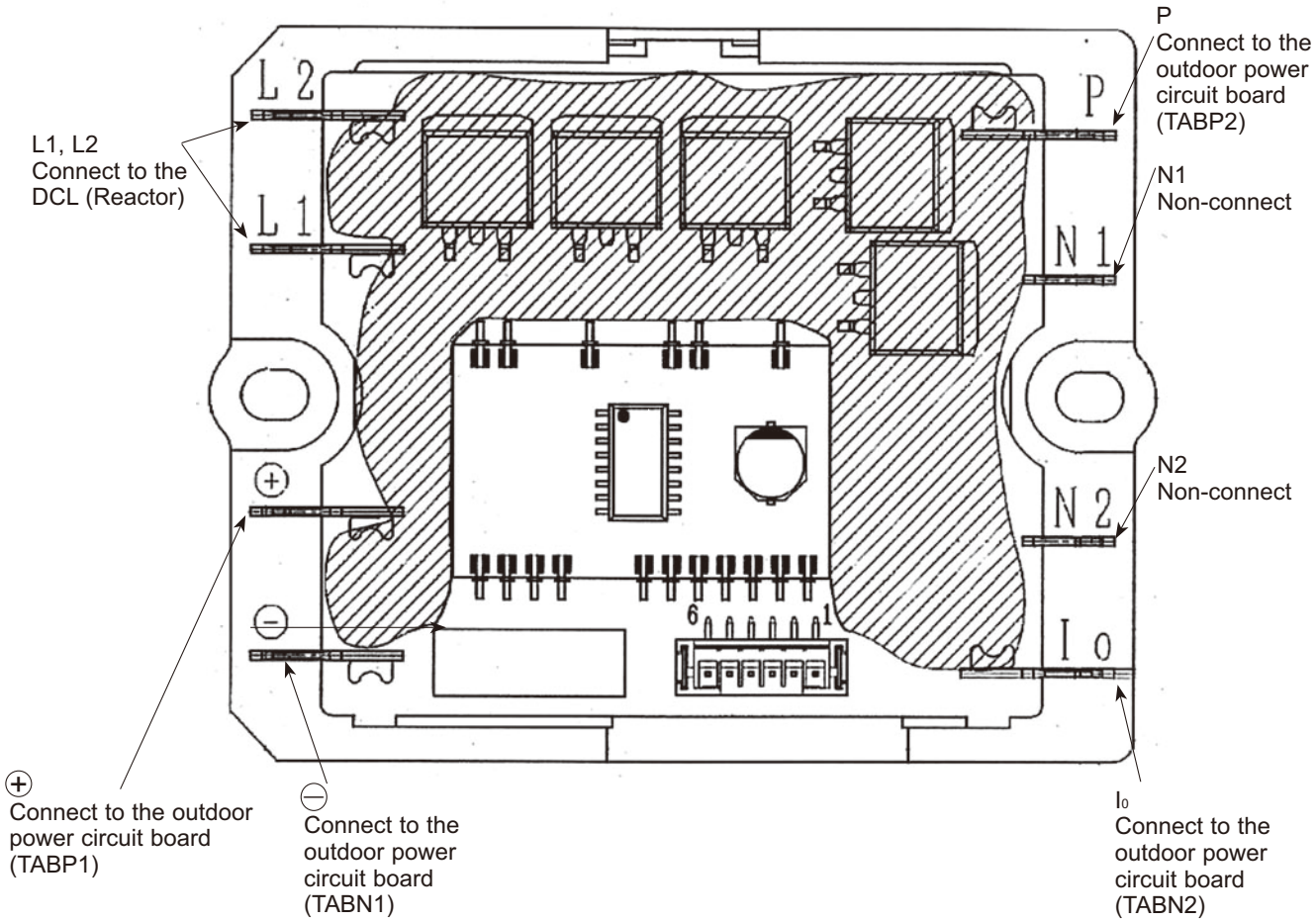
TABN2
Connect to ACTM



Interface circuit board



Active filter module(ACTM)



8-7. OUTDOOR UNIT OPERATION MONITOR FUNCTION

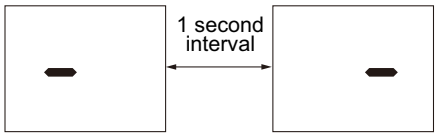
Operation indicator SW2 : Indicator change of self diagnosis

SW2 setting	Display detail	Explanation for display	Unit
ON 1 2 3 4 5 6			

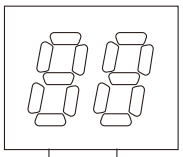
<Digital indicator LED3 working details>
(Be sure that the 1 to 6 in the SW2 are set to OFF.)

(1) Display when the power supply is ON.
When the power supply is ON, blinking displays by turns.
Wait for 10 seconds at the longest.

(2) When the display lights (Normal operation)
①Operation mode display



LED3



(Lighting)

SW2

ON 1 2 3 4 5 6 (Initial setting)

The tens digit : Operation mode

Display	Operation Model
O	OFF
C	COOLING
H	HEATING
d	DEFROSTING

②Display during error postponement
Postponement code is displayed when compressor stops due to the work of protection device.
Postponement code is displayed while error is being postponed.

The ones digit : Relay output

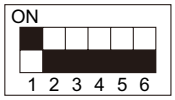
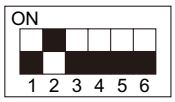
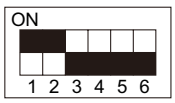
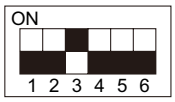
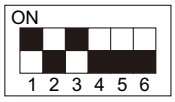
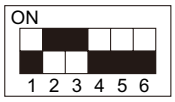
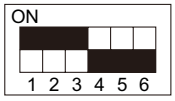
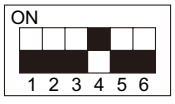
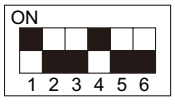
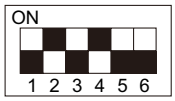
Display	Warming-up Compressor	Compressor	4-way valve	Solenoid valve
0	—	—	—	—
1	—	—	—	ON
2	—	—	ON	—
3	—	—	ON	ON
4	—	ON	—	—
5	—	ON	—	ON
6	—	ON	ON	—
7	—	ON	ON	ON
8	ON	—	—	—
A	ON	—	ON	—

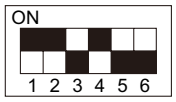
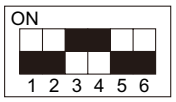
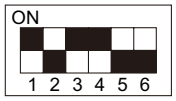
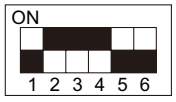
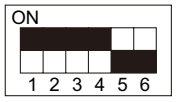
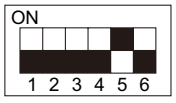
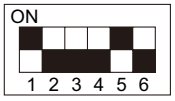
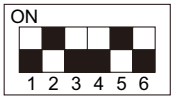
(3) When the display blinks
Inspection code is displayed when compressor stops due to the work of protection devices.

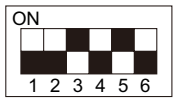
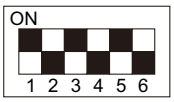
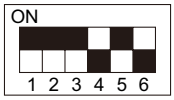
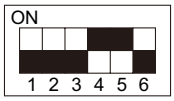
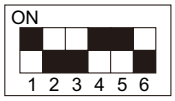
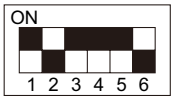
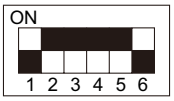
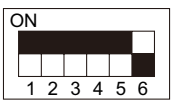
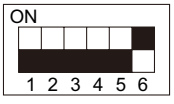
Display	Inspection unit
0	Outdoor unit

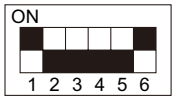
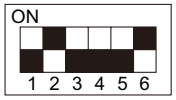
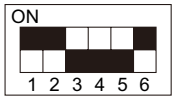
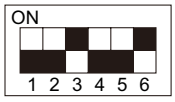
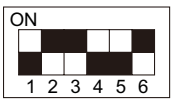
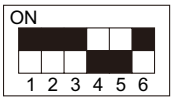
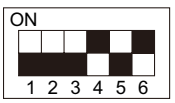
Display	Contents to be inspected (During operation)
U1	Abnormal high pressure (63H worked)
U2	Abnormal high discharging temperature, shortage of refrigerant
U3	Open/short circuit of discharging thermistor(TH4)
U4	Open/short of outdoor unit thermistors(TH3, TH32, TH6, TH7 and TH8)
U5	Abnormal temperature of heatsink
U6	Abnormality of power module
U7	Abnormality of superheat due to low discharge temperature
U8	Abnormality in outdoor fan motor
U9	Voltage fault, Input current sensor error
Ud	Overheat protection
UF	Compressor overcurrent interruption (When Comp. locked)
UH	Current sensor error, Input overcurrent interruption
UP	Compressor overcurrent interruption
P6	Freezing/overheating protection is working.
P8	Abnormality of pipe temperature
UE	Abnormal pressure of pressure sensor
PE	Abnormality of entering water temperature
Ed	Serial communication error

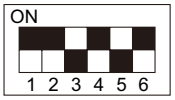
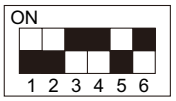
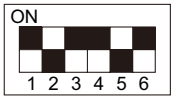
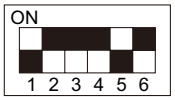
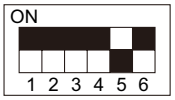
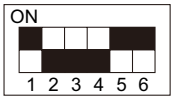
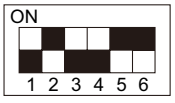
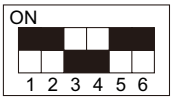
Display	Contents to be inspected (When power is turned on)
F5	63H connector(yellow) is open.

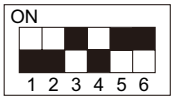
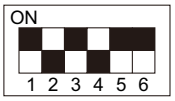
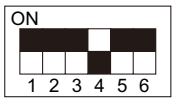
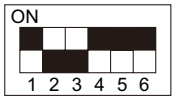
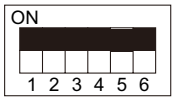
SW2 setting	Display detail	Explanation for display	Unit
	Pipe temperature / Liquid(TH3) – 40~90	– 40~90 (When the coil thermistor detects 0℃ or below, "–" and temperature are displayed by turns.) (Example) When -10℃; 0.5 secs. 0.5secs. 2 secs. -□ →10 →□□	℃
	Discharge temperature (TH4) 3~217	3~217 (When the discharge thermistor detects 100℃ or more, hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 105℃; 0.5 secs. 0.5secs. 2 secs. □1 →05 →□□	℃
	Fan steps 0~10	0~10	Step
	Compressor ON/OFF 0~9999	0~9999 (When the number of times is 100 or more, hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 42500 times (425 ×100 times); 0.5 secs. 0.5secs. 2 secs. □4 →25 →□□	100 times
	Compressor accumulated operation hours 0~9999	0~9999 (When it is 100 hours or more, hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 2450 hours (245 ×10 hours); 0.5 secs. 0.5secs. 2 secs. □2 →45 →□□	10 hours
	Compressor running current 0~50	0~50 ※to round off at decimal point	A
	Compressor running frequency 0~225	0~255 (When it is 100Hz or more, hundreds digit, tens digit and ones digit are displayed by turns. (Example) When 105Hz; 0.5 secs. 0.5secs. 2 secs. □1 →05 →□□	Hz
	LEV-A opening pulse 0~500	0~500 (When it is 100 pulse or more, hundreds digit, tens digit and ones digit are displayed by turns. (Example) When 150 pulse; 0.5 secs. 0.5secs. 2 secs. □1 →50 →□□	Pulse
	Deferred error history (1)	Deferred error Blinking: being deferred Lighting: deferment cancelled "00" is displayed in case of no deferment	Code display
	Operation mode when the error occured.	Operation mode when the unit is stopped due to error. The code when the SW2 is set like below. (SW2)	Code display

SW2 setting	Display detail	Explanation for display	Unit
	Pipe temperature / Liquid(TH3) when error occured. – 40~90	– 40~90 (When the coil thermistor detects 0℃ or below, "–" and temperature are displayed by turns.) (Example) When –15℃; 0.5 secs. 0.5secs. 2 secs. -□ →15 →□□	℃
	Discharge temperature (TH4) when error occured. 3~217	3~217 (When the temperature is 100℃ or more, the hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 130℃; 0.5 secs. 0.5secs. 2 secs. □1 →30 →□□	℃
	Compressor current when error occred. 0~50	0~50	A
	Error code history (1) (latest) Alternate display of faulty unit number and error code	When no error history, " 0 " and "– –" are displayed by turns.	Code display
	Error code history (2) Alternate display of faulty unit number and error code	When no error history, " 0 " and "– –" are displayed by turns.	Code display
	Compressor operation duration 0~999	0~999 (When it is 100 minutes or more, the hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 245 minutes; 0.5 secs. 0.5secs. 2 secs. □2 →45 →□□	Minute
	LEV-B opening when error occured.	0~500 (When it is 100 pulse or more, hundreds digit, tens digit and ones digit are displayed by turns. (Example) When 150 pulse; 0.5 secs. 0.5secs. 2 secs. □1 →50 →□□	Pulse
	Capacity settings	Shown as the outdoor capacity code. Model: PUHZ-W90VHA, Code: 14	Code display

SW2 setting	Display detail	Explanation for display	Unit
	Plate HEX liquid pipe temperature(TH6) – 39~88	– 39~88 (When the temperature is 0℃ or less, "–" and temperature are displayed by turns.)	℃
	Condensing temperature(T_{63HS}) – 39~88	– 39~88 (When the temperature is 0℃ or less, "–" and temperature are displayed by turns.)	℃
	Caliculated maximum frequency 0~150	0~150 (When it is 100Hz or more, hundreds digit, tens digit and ones digit are displayed by turns. (Example) When 105Hz; 0.5 secs. 0.5secs. 2 secs. □1 →05 →□□	Hz
	Water inlet temperature (TH32) 0~100	0~100	℃
	Requested capacity step(QSTEP) 0~7	0~7	Step
	Ambient temperature (TH7) -39~88	-39~88 (When the temperature is 0℃ or less, "–" and temperature are displayed by turns.)	℃
	Outdoor heatsink temperature (TH8) -40~200	-40~200 (When the temperature is 0℃ or less, "–" and temperature are displayed by turns.) (When the thermistor detects 100℃ or more, hundreds digit, tens digit and ones digit are displayed by turns.)	℃
	Discharge superheat (SHd) 0~255 [Cooling and Heating:SHd=TH4-T_{63HS}]	0~255 (When the SHd is 100°C or more, hundreds digit, tens digit and ones digit are displayed by turns.)	°C
	Sub cool (SC) 0~130 [Cooling:SC = T_{63HS}-TH3 Heating:SC = T_{63HS}-TH6]	0~130 (When the SC is 100°C or more, hundreds digit, tens digit and ones digit are displayed by turns.)	°C

<table>
<tr><th>SW2 setting</th><th>Display detail</th><th>Explanation for display</th><th>Unit</th></tr>
<tr><td>  </td><td>Input current of outdoor unit
0~500</td><td>0~500
(When it is 100 or more, hundreds digit, tens digit and ones digit are displayed by turns.)</td><td>0.1 A</td></tr>
<tr><td>  </td><td>LEV-B opening pulse
0~500</td><td>0~500
(When it is 100 pulse or more, hundreds digit, tens digit and ones digit are displayed by turns.)</td><td>Pulse</td></tr>
<tr><td>  </td><td>U9 error detail history(latest)</td><td><table><tr><th>Error details</th><th>Cause</th><th>Code</th></tr><tr><td>(No error)</td><td>—</td><td>00</td></tr><tr><td>Over voltage</td><td>Power PCB</td><td>01</td></tr><tr><td>Insufficient voltage</td><td>Power PCB</td><td>02</td></tr><tr><td>Input current sensor error</td><td>Control PCB</td><td>04</td></tr><tr><td>ACTM error</td><td>Control PCB</td><td>20</td></tr></table></td><td>Code display</td></tr>
<tr><td>  </td><td>Direct current bus line voltage
150~400</td><td>150~400
(When it is 100V or more, hundreds digit, tens digit and ones digit are displayed by turns.)</td><td>V</td></tr>
<tr><td>  </td><td>Deferred error history (2)
of outdoor unit</td><td>Deferred error code display
Blinking: being deferred
Lighting: deferment cancelled
“00” is displayed in case of no deferment.</td><td>Code display</td></tr>
<tr><td>  </td><td>Deferred error history (3)
of outdoor unit</td><td>Deferred error code display
Blinking: being deferred
Lighting: deferment cancelled
“00” is displayed in case of no deferment.</td><td>Code display</td></tr>
<tr><td>  </td><td>Error code history (3) (Oldest)
Faulty unit number and error code are displayed alternately.</td><td>When no error history, “0” and “– –“ are displayed by turns.</td><td>Code display</td></tr>
<tr><td> </td><td>Error thermistor display
[When there is no error thermistor, “–“ is displayed.]</td><td>3: Liquid pipe thermistor (TH3)
3: Water inlet temp. thermistor (TH32)
6: Plate HEX liquid pipe thermistor (TH6)
7: Ambient temp.thermistor (TH7)
8: Heatsink thermistor (TH8)</td><td>Code display</td></tr>
</table>

SW2 setting	Display detail	Explanation for display	Unit
	Operation frequency when error occured. 0~225	0~225 (When it is 100Hz or more, hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 105Hz; 0.5 secs. 0.5secs. 2 secs. □1 →05 →□□	Hz
	Fan step when error occured. 0~10	0~10	Step
	LEV-A opening pulse when error occured. 0~500	0~500 (When it is 100 pulse or more, hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 130 pulse; 0.5 secs. 0.5secs. 2 secs. □1 →30 →□□	Pulse
	Water inlet temperature (TH32) when error occured. 0~100	0~100	℃
	Plate HEX liquid pipe temperature(TH6) when error occured. -39~88	-39~88 (When the temperature is 0°C or less, "–" and temperature are displayed by turns.) (Example) When –15°C; 0.5 secs. 0.5secs. 2 secs. -□ →15 →□□	℃
	Condensing temperature when error occured. -39~88	-39~88 (When the temperature is 0°C or less, "–" and temperature are displayed by turns.) (Example) When –15°C; 0.5 secs. 0.5secs. 2 secs. -□ →15 →□□	℃
	Ambient temperature (TH7) when error occured. -39~88	-39~88 (When the temperature is 0°C or less, "–" and temperature are displayed by turns.) (Example) When –15°C; 0.5 secs. 0.5secs. 2 secs. -□ →15 →□□	℃
	Outdoor heatsink temperature (TH8) when error occured. -40~200	-40~200 (When the temperature is 0°C or less, "–" and temperature are displayed by turns.) (When the temperature is 100°C or more, hundreds digit, tens digit and ones digit are displayed by turns.)	℃
	Discharge superheat (SHd) when error occured. 0~255 [Cooling and Heating :SHd=TH4-T_{63HS}]	0~255 (When the temperature is 100°C or more, hundreds digit, tens digit and ones digit are displayed by turns.) (Example) When 150°C; 0.5 secs. 0.5secs. 2 secs. □1 →50 →□□	℃

<table>
<tr><th>SW2 setting</th><th>Display detail</th><th>Explanation for display</th><th>Unit</th></tr>
<tr><td> 
</td><td>Sub cool (SC) when error occured.
0~130
[Cooling:SC = T_{63HS}-TH3
Heating:SC = T_{63HS}-TH6]</td><td>0~130
(When the temperature is 100°C or more, hundreds digit, tens digit and ones digit are displayed by turns.)
(Example) When 115°C;
0.5 secs. 0.5secs. 2 secs.
□1 →15 →□□</td><td>℃</td></tr>
<tr><td> 
</td><td>Compressor operation duration before the unit stops with error.
0~999</td><td>0~999
(When it is 100 minutes or more, hundreds digit, tens digit and ones digit are displayed by turns.)
(Example) When 415 minutes;
0.5 secs. 0.5secs. 2 secs.
□4 →15 →□□</td><td>Minute</td></tr>
<tr><td>
</td><td>Maximum frequency when error occured.
0~150</td><td>0~150
(When it is 100Hz or more, hundreds digit, tens digit and ones digit are displayed by turns.
(Example) When 105Hz;
0.5 secs. 0.5secs. 2 secs.
□1 →05 →□□</td><td>Hz</td></tr>
<tr><td> 
</td><td>Requested capacity step when error occured.
0~7</td><td>0~7</td><td>Step</td></tr>
<tr><td> 
</td><td>Compressor frequency control status</td><td>The following code will be a help to know the operating status of unit.
•Ten place(left side):
<table><tr><th>Display</th><th>Compressor frequency control</th></tr><tr><td>1</td><td>Input current restriction control</td></tr><tr><td>2</td><td>Compressor current restriction control</td></tr></table>
•First digit(Total figure of the corresponding relays are displayed.)
<table><tr><th>Display</th><th>Compressor frequency control</th></tr><tr><td>1</td><td>Discharge temp.control(not to over rise).</td></tr><tr><td>2</td><td>Condensing temp.control(not to over rise).</td></tr><tr><td>4</td><td>Freezing protection control</td></tr><tr><td>8</td><td>Heatsink temp.control(not to over rise).</td></tr></table>
When the following 3 points are under control;
(1) Input current restriction control.
(2) Condensing temp.control(not to over rise).
(3) Heatsink temp.control(not to over rise).
LED
 </td><td>Code display</td></tr>
<tr><td> 
</td><td>U9 Error details (To be shown while error call is deferred.)</td><td><table><tr><th>Error details</th><th>Cause</th><th>Code</th></tr><tr><td>(No error)</td><td>—</td><td>00</td></tr><tr><td>Over voltage</td><td>Power PCB</td><td>01</td></tr><tr><td>Insufficient voltage</td><td>Power PCB</td><td>02</td></tr><tr><td>Input current sensor error</td><td>Control PCB</td><td>04</td></tr><tr><td>ACTM error</td><td>Control PCB</td><td>20</td></tr></table></td><td>Code display</td></tr>
</table>

8-8. FUNCTION OF SWITCHES

Switch		Function	Selection		Initial setting*	Function details	Effective timing (SW1, 8) / Note (SW6)
mark	No.		ON (with)	OFF (without)			
SW1	1	Forced defrosting	ON to start	Usual setting	OFF	Switch ON to forced defrosting	When compressor is working in heating mode.*1
	2	To clear error history	ON to clear	Usual setting	OFF	Switch ON to clear (erase) the followings: (1)Error codes and Suspension flags in RAM (2)Error codes and Suspension flags in EEPROM	off or operating
	3	No function	Do NOT use	PUHZ-W90VHA	OFF	–	–
	4	No function	Do NOT use	PUHZ-W90VHA	OFF		
	5	No function	Do NOT use	PUHZ-W90VHA	OFF		
	6	No function	Do NOT use	PUHZ-W90VHA	OFF		
SW6	1	Model Setting 1	Do NOT use	PUHZ-W90VHA	OFF	PCB may be damaged, if switched ON.	ON for other models
	2	Defrost control selection	For high humidity	Standard	OFF	Switch ON to change conditions (standard / high himidity) to start defrosting	–
	3~6	Model Setting 2	SW6: 3=1, 4=0, 5=1, 6=0 1=ON, 0=OFF		As shown in the left table	–	Make sure to set SW6-3 to 6 correctly
SW8	1	Mode selection	Energy saving mode	Powerful mode	OFF	–	Always
	2	Cooling only, Heating only or Reversible	Cooling only or Heating only	Reversible	OFF	To select Cooling only, Heating only or Reversible	Always
	3	To fix operation mode	Cooling only	Heating only	OFF	To fix as Cooling Only or Heating Only	Always

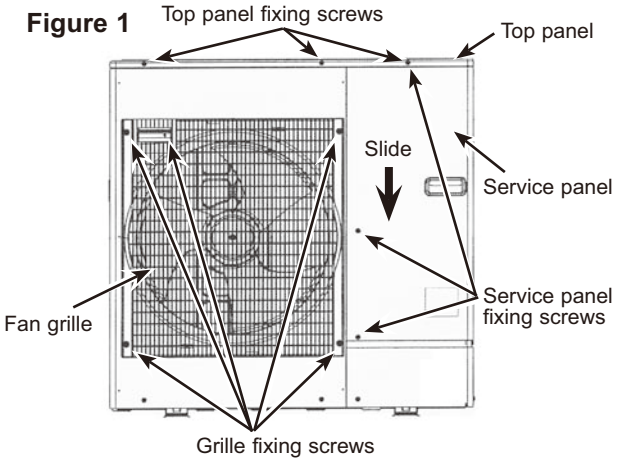
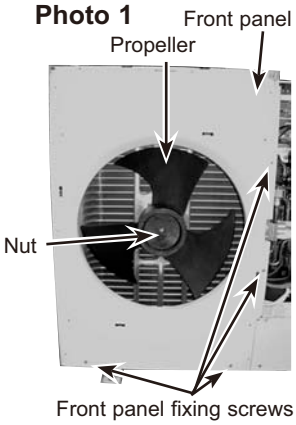
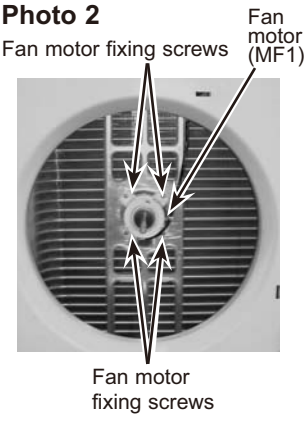
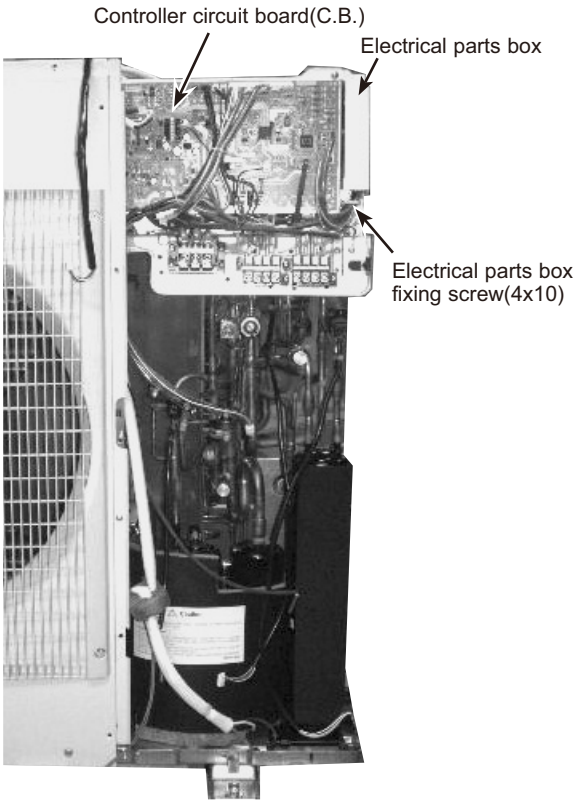
<Important Note>
All these dip switches on PUHZ-W90VHA are set as shown above.
Spare PCBs, however, will be supplied without any settings, which means that all dip switches are switched OFF.
When servicing, please make sure to set all switches correctly, referring to the previous PCB which is removed from the unit.

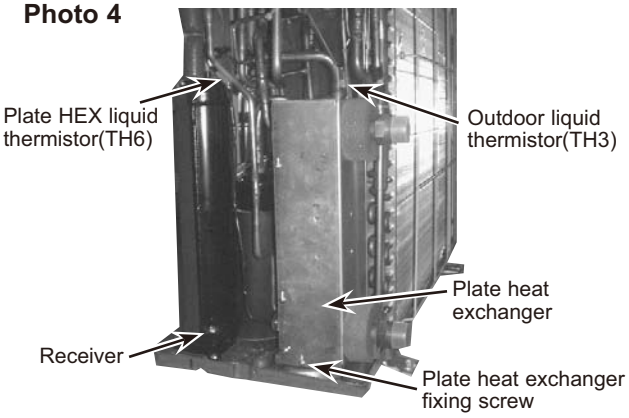
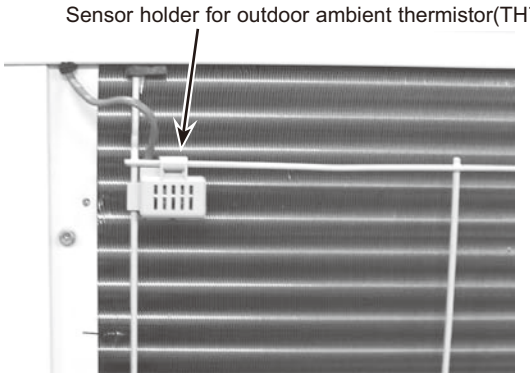
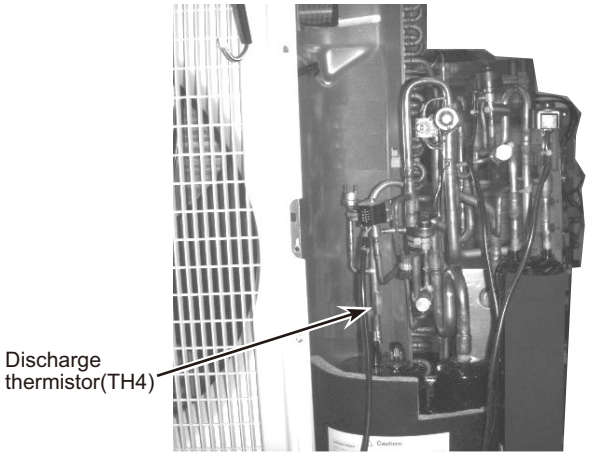
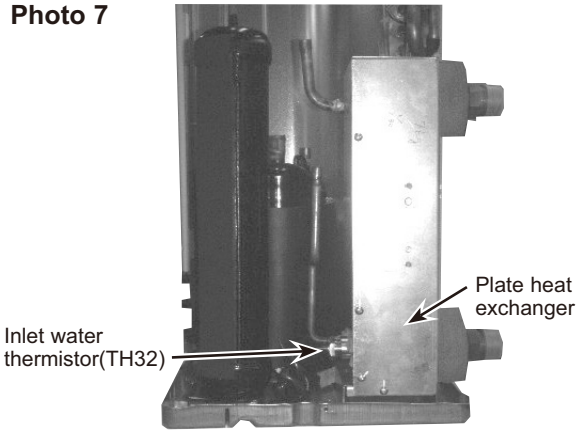
*1. Forced defrosting should be done as follows.
①Change the DIP SW1-1 on the outdoor controller board from OFF to ON.
②Forced defrosting will start by the above operation ① if these conditions written below are satisfied.
- Heat mode setting
- 10 minutes have passed since compressor started operating or previous forced defrosting finished.
- Pipe temperature is less than or equal to 8℃.
- Forced defrosting will finish if certain conditions are satisfied.

Forced defrosting can be done if above conditions are satisfied when DIP SW1-1 is changed from OFF to ON.
After DIP SW1-1 is changed from OFF to ON, there is no problem if DIP SW1-1 is left ON or changed to OFF again. This depends on the service conditions.

9 DISASSEMBLY PROCEDURE

PUHZ-W90VHA

OPERATING PROCEDURE	PHOTOS&ILLUSTRATION
1. Removing the service panel and top panel (1) Remove 3 screws (5x10) and slide the hook on the right downward to remove the service panel. (2) Remove screws (3 for front, 3 for rear/5x10) of the top panel and remove it.	**Figure 1** 
2. Removing the fan motor (MF1) (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove 5 screws (5x10) to detach the fan grille. (See figure 1.) (4) Remove a nut (for right handed screw of M6) to detach the propeller. (See photo 1.) (5) Disconnect the connector CNF1 on controller circuit board in electrical parts box. (6) Remove 4 screws (5x25) to detach the fan motor. (See photo 2.)	**Photo 1**  **Photo 2** 
3. Removing the electrical box (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Disconnect the connecting wires from terminal block. (4) Remove all the following connectors from controller circuit board; fan motor, linear expansion valve(x2), thermistor<Liquid pipe>, thermistor<Discharge>, thermistor<Plate HEX Liquid>, thermistor<Outdoor ambient>, high pressure sensor, high pressure switch, four-way valve and bypass valve. Then remove a screw (4x8) from the valve bed to remove the lead wire. Pull out the disconnected wire from the electrical parts box. <Diagram symbol in the connector housing> • Fan motor (CNF1) • Linear expansion valve (LEV-A and LEV-B) • Thermistor <Liquid pipe> (TH3) • Thermistor <Discharge> (TH4) • Thermistor <Plate HEX Liquid, Outdoor Ambient> (TH6/7) • High pressure sensor (63HS) • High pressure switch (63H) • Solenoid valve coil <Four-way valve> (21S4) • Solenoid valve coil <Bypass valve> (SV2) (5) Remove the terminal cover and disconnect the compressor lead wires. (6) Remove a screw (4x10) and detach the electrical parts box by pulling it upward. The electrical parts box is fixed with 2 hooks on the left and 1 hook on the right.	**Photo 3** 

OPERATING PROCEDURE	PHOTOS&ILLUSTRATION
4. Removing the thermistor <Plate HEX Liquid> (TH6) (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Disconnect the connectors, TH6 and TH7 (red), on the controller circuit board. (4) Loosen the clamps for the lead wire. (5) Pull out the thermistor <Plate HEX Liquid> (TH6) from the sensor holder. **Note: In case of replacing thermistor <Plate HEX Liquid> (TH6), replace it together with thermistor<Outdoor ambient> (TH7), since they are combined together. Refer to No.5 below to remove thermistor <Outdoor ambient>.**	**Photo 4** 
5. Removing the thermistor <Outdoor ambient> (TH7) (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Disconnect the connector TH6 and TH7(red) on the controller circuit board. (4) Loosen the clamps for the lead wire. (5) Pull out the thermistor <Outdoor ambient> (TH7) from the sensor holder. **Note: In case of replacing thermistor <Outdoor ambient> (TH7), replace it together with thermistor <Plate HEX Liquid> (TH6), since they are combined together. Refer to No.4 above to remove thermistor <Plate HEX Liquid>.**	**Photo 5** 
6. Removing the thermistor <Liquid pipe> (TH3) and thermistor <Discharge> (TH4) (1) Remove the service panel. (See figure 1.) (2) Disconnect the connectors, TH3 (white) and TH4 (white), on the controller circuit board. (3) Loosen the clamps for the lead wire. (4) Pull out the thermistor <Liquid pipe> (TH3) (See photo 4) and thermistor <Discharge> (TH4) from the sensor holder.	**Photo 6** 
7. Removing the thermistor <Inlet Water> (TH32) (1) Remove the service panel. (See figure 1.) (2) Remove 2 screws (5x10) and remove the front cover panel. (3) Remove 2 screws (5x10) and remove the back cover panel. (4) Disconnect the connectors, TH32 (black) on the controller circuit board. (5) Loosen the clamp for the lead wire. (6) Remove the thermistor <Inlet water> (TH32) from the plate heat exchanger. **Note: Before removing the thermistor<Inlet water>(TH32), recover water in the plate heat exchanger.**	**Photo 7** 

OPERATING PROCEDURE

8. Removing the solenoid valve coil <Four-way valve> (21S4) linear expansion valve coil (LEV (A), LEV (B)) and solenoid valve coil <Bypass valve> (SV)

(1) Remove the service panel. (See figure 1.)
(2) Remove the top panel. (See figure 1.)
(3) Remove the electrical parts box. (See photo 3.)
[Removing the solenoid valve coil <Four-way valve>]
(4) Remove solenoid valve coil <Four-way valve> fixing screw(M4x6).
(5) Remove the solenoid valve coil <Four-way valve>.
(6) Disconnect the connector 21S4 (green) on the controller circuit board.
[Removing the linear expansion valve coil]
(4) Remove the linear expansion valve coil by sliding the coil upward.
(5) Disconnect the connectors, LEV A (white) and LEV B (red), on the controller circuit board.
[Removing the solenoid valve coil <Bypass valve>]
(4) Remove the solenoid valve coil <Bypass valve> fixing screw(M4x6).
(5) Remove the solenoid valve coil <Bypass valve> by sliding the coil upward.
(6) Disconnect the connector SV2 (blue) on the controller circuit board.

9. Removing the four-way valve

(1) Remove the service panel. (See figure 1.)
(2) Remove the top panel. (See figure 1.)
(3) Remove the electrical parts box. (See photo 3.)
(4) Remove 3 stay fixing screws (4x10) and remove the stay.
(5) Remove 3 right side panel fixing screw (5x10) in the rear of the unit and remove the right side panel.
(6) Remove the solenoid valve coil <Four-way valve>. (See photo 8.)
(7) Recover refrigerant.
(8) Remove the welded part of four-way valve.

Note 1: Recover refrigerant without letting it out in the air.
Note 2: The welded part can be removed easily by removing the right side panel.
Note 3: When installing the four-way valve, make sure to cover it with a wet cloth to prevent it from heating (120°C or more), then braze the pipes so that the inside of pipes are not oxidized.

10. Removing linear expansion valve

(1) Remove the service panel. (See figure 1.)
(2) Remove the top panel. (See figure 1.)
(3) Remove the electrical parts box. (See photo 3.)
(4) Remove 3 stay fixing screws (4x10) and remove the stay.
(5) Remove 3 right side panel fixing screw (5x10) in the rear of the unit and then remove the right side panel.
(6) Remove the linear expansion valve.
(7) Recover refrigerant.
(8) Remove the welded part of linear expansion valve.

Note 1: Collect refrigerant without spreading it in the air.
Note 2: The welded part can be removed easily by removing the back panel.
Note 3: When installing the linear expansion valve, cover it with a wet cloth to prevent it from heating (120°C or more), then braze the pipes so that the inside of pipes are not oxidized.

PHOTOS&ILLUSTRATION

Photo 8

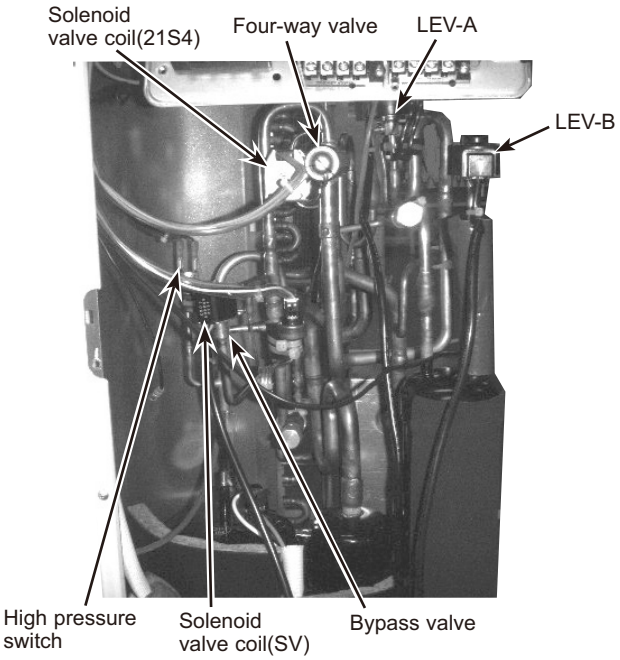
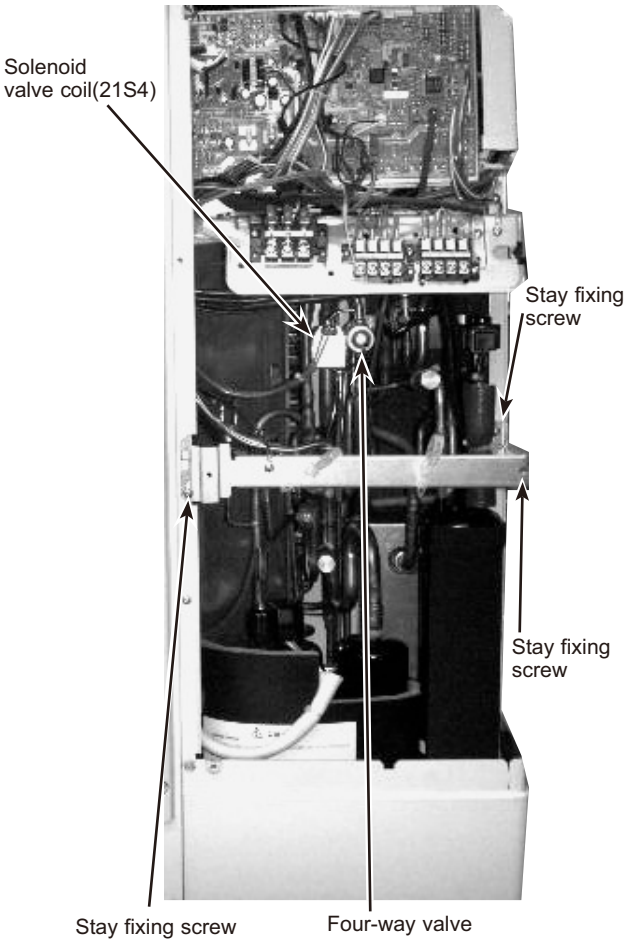
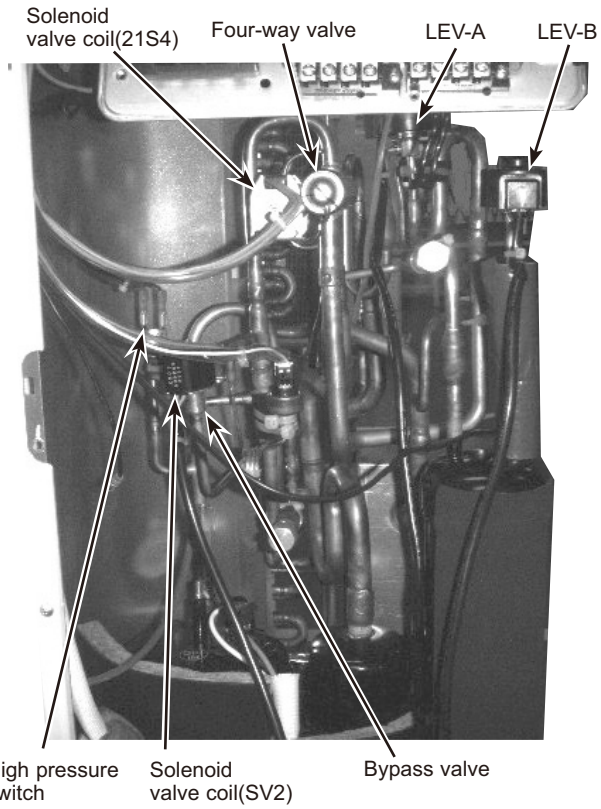
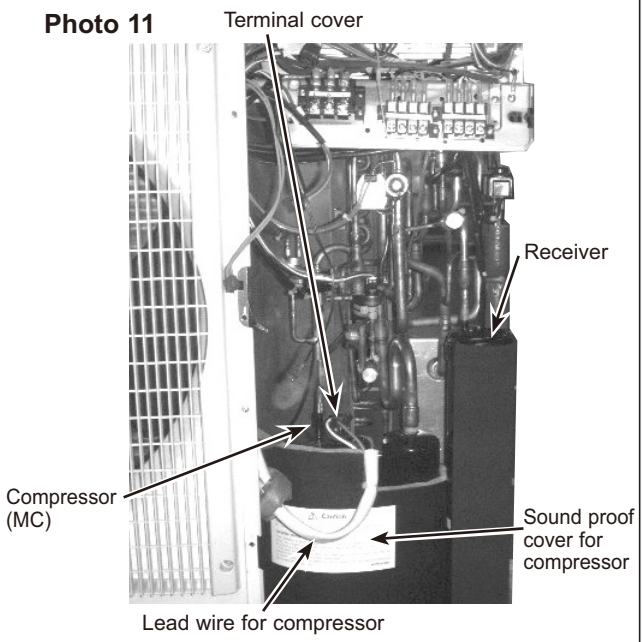
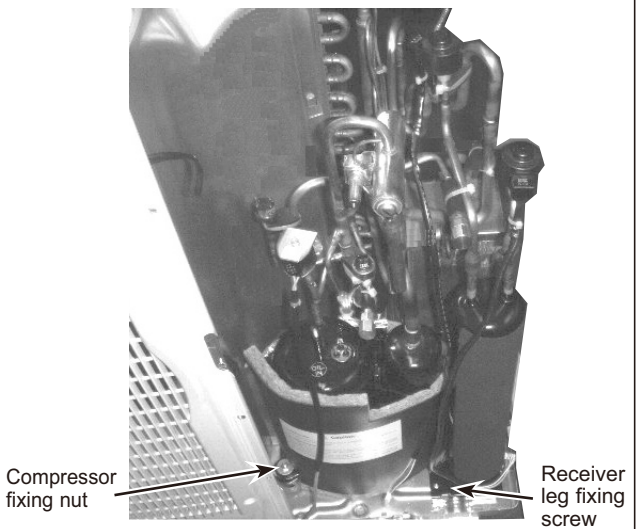
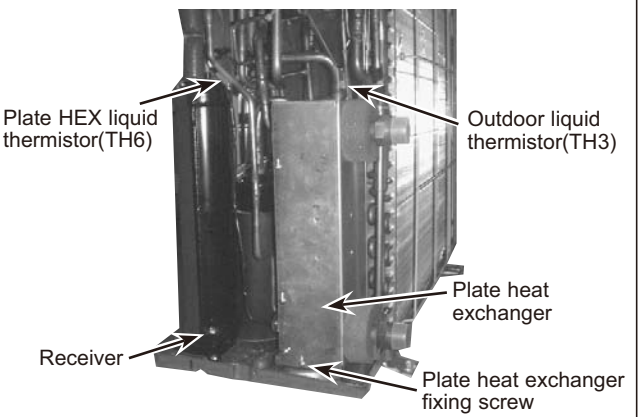


Photo 9



OPERATING PROCEDURE	PHOTOS&ILLUSTRATION
11. Removing the bypass valve (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove the electrical parts box. (See photo 3.) (4) Remove 3 right side panel fixing screws (5x10) in the rear of the unit and remove the right side panel. (5) Remove the bypass valve solenoid coil. (6) Recover refrigerant. (7) Remove the welded part of bypass valve. **Note 1: Recover refrigerant without letting it out in the air.** **Note 2: The welded part can be removed easily by removing the right side panel.**	**Photo 10** 
12. Removing the high pressure switch (63H) (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove the electrical parts box. (See photo 3.) (4) Remove 3 right side panel fixing screws (5x10) in the rear of the unit and remove the right side panel. (5) Pull out the lead wire of high pressure switch. (6) Recover refrigerant. (7) Remove the welded part of high pressure switch. **Note 1: Recover refrigerant without letting it out in the air.** **Note 2: The welded part can be removed easily by removing the right side panel.** **Note 3: When installing the high pressure switch, make sure to cover it with a wet cloth to prevent it from heating (120°C or more), then braze the pipes so that the inside of pipes are not oxidized.**	
13. Removing the high pressure sensor (63HS) (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove the electrical parts box. (See photo 3.) (4) Remove 3 right side panel fixing screws (5x10) in the rear of the unit and remove the right side panel. (5) Pull out the lead wire of high pressure sensor. (6) Recover refrigerant. (7) Remove the welded part of high pressure sensor. **Note 1: Recover refrigerant without letting it out in the air.** **Note 2: The welded part can be removed easily by removing the right side panel.** **Note 3: When installing the high pressure switch, make sure to cover it with a wet cloth to prevent it from heating (120°C or more), then braze the pipes so that the inside of pipes are not oxidized.**	

OPERATING PROCEDURE	PHOTOS&ILLUSTRATION
14. Removing the compressor (MC) (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove 2 screws (5x10) and remove the front cover panel. (4) Remove 2 screws (5x10) and remove the back cover panel. (5) Remove the electrical parts box. (See photo 3.) (6) Remove 3 screws (4x10) and remove the stay. (See photo 9.) (7) Remove 3 screws (5x10) in the rear of the unit and remove the right side panel. (8) Remove 5 screws (1:4x10 4:5x10) and remove the front panel. (9) Remove 3 screws (4x10) and remove the separator. (10) Remove the terminal cover and remove the lead wire for compressor. (11) Remove the soundproof cover for compressor. (12) Recover refrigerant. (13) Remove the 3 points of the compressor fixing nut using a spanner or a adjustable wrench. (14) Remove the welded pipe of the compressor, then remove the compressor. **Note 1: Recover refrigerant without letting it out in the air.**	**Photo 11** 
15. Removing the receiver (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove 2 screws (5x10) and remove the front cover panel. (4) Remove 2 screws (5x10) and remove the back cover panel. (5) Remove the electrical parts box. (See photo 3.) (6) Remove 3 screws (4x10) and remove the stay. (See photo 9.) (7) Remove 3 screw (5x10) in the rear of the unit and remove the right side panel. (8) Recover the refrigerant. (9) Remove 2 welded pipes of receiver. (10) Remove 2 receiver leg fixing screws (4x10), then remove the receiver. **Note 1: Recover refrigerant without letting it out in the air.**	**Photo 12** 
16. Removing the plate heat exchanger (1) Remove the service panel. (See figure 1.) (2) Remove the top panel. (See figure 1.) (3) Remove 2 screws (5x10) and remove the front cover panel. (4) Remove 2 screws (5x10) and remove the back cover panel. (5) Remove the electrical parts box. (See photo 3.) (6) Remove 3 screws (4x10) and remove the stay. (See photo 9.) (7) Remove 3 screw (5x10) in the rear of the unit and remove the right side panel. (8) Recover the refrigerant (9) Remove 2 welded pipes of plate heat exchanger inlet and outlet. (10) Remove 2 plate heat exchanger fixing screws (4x10), then remove the plate heat exchanger. **Note 1: Recover refrigerant without letting it out in the air.** **Note 2:Before removing the thermistor <Inlet water>(TH32), recover water in the plate heat exchanger.**	**Photo 13** 

OPERATING PROCEDURE

17. Removing the interface circuit board (I.F.) : Figure 2
(1) Remove 2 Interface board cover fixing screws (4x10).
(2) Remove all lead wire connectors (CNIF1, CNIF2, CNIF3, CNIF4) on interface circuit board (I.F.).
(3) Remove interface circuit board from the C.B. base.(5 supports)

18. Removing the controller circuit board (C.B.) : Figure 2
(1) Remove all lead wire connectors on controller circuit board (C.B.). CNF1,CNDC,CNAC,CN2,CN4,CN52C,CN3S,CNDM,CN51 21S4,SV2,63H,63HS,LEV-A,LEV-B, TH32,TH7/6,TH3,TH4
(2) Remove controller circuit board from the C.B. base.(5 supports)

19. Removing the noise filter circuit board (N.F.) : Figure 2, Photo 14
(1) Remove E2,CN5,LO,NO lead wire connectors from noise filter circuit board (N.F.).
(2) Remove E1 lead wire connector from electrical parts box.
(3) Remove L, N lead wire connectors from terminal block (TB1).
(4) Remove 4 screws (4x10) for fixing the C.B. base and detach the C.B. base from the electrical parts box.
(5) Remove CNAC1, CNAC2, E1, LI, NI lead wire connectors from noise filter circuit board (N.F.).
(6) Remove noise filter circuit board from the C.B. base. (11 supports)

20. Removing the power circuit board (P.B.) : Figure 2, Photo 15
(1) Remove CN2, CN4, CNDC lead wire connectors from controller circuit board (C.B.).
(2) Remove LO, NO, CN5 lead wire connectors from noise filter circuit board (N.F.).
(3) Remove 4 screws(4x10) for fixing the C.B. base and detach the C.B. base from the electrical parts box.
(4) Remove all lead wire connectors on power circuit board (P.B.). CNAF, CN2, CN3, CN5, CN4, CNDC TABU, TABV ,TAVW, TABT, TABS, TABP1, TABN1, TABN2
(5) Remove power circuit board from the electrical parts box. (3 supports and 4 screws (2 screws (3x12) + 2screws (4x18))

21. Removing the active filter module (ACTM) : Figure 2, Photo15
(1) Remove CN2, CN4, CNDC lead wire connectors from controller circuit board (C.B.).
(2) Remove LO, NO, CN5 lead wire connectors from noise filter circuit board (N.F.).
(3) Remove 4 screws (4x10) for fixing the C.B. base and detach the C.B. base from the electrical parts box.
(4) Remove all lead wires on active filter module (ACTM). L1, L2, P, Io, +, -, CNAF (4 wires)
(5) Remove the active filter module (ACTM) from the electrical parts box.(2 screws (4x14))

22. Removing the reactor (DCL) : Figure 2, Photo16
(1) Remove 4 reactor fixing screws (4x16) to detach the reactor (DCL).
(2) Disconnect L1,L2 lead wire from active filter module (ACTM).Remove reactor wire from wire supoort.

23. Removing the thermistor <HEATSINK> (TH8) : Photo 15
(1) Remove CN2, CN4, CNDC lead wire connectors from controller circuit board (C.B.).
(2) Remove LO, NO, CN5 lead wire connectors from noise filter circuit board (N.F.).
(3) Remove 4 screws(4x10) for fixing the C.B. base and detach the C.B. base from the electrical parts box.
(4) Remove all lead wire connectors on power circuit board (P.B.). CNAF,CN2,CN3,CN5,CN4,CNDC TABU,TABV,TAVW,TABT,TABS,TABP1,TABN1,TABN2
(5) Remove power circuit board from the electrical parts box. (3 supports and 4 screws(2 screws(3x12) + 2screws(4x18))
(6) Remove the thermistor<HEATSINK> from the electrical parts box. (1 screw(3x12)

PHOTOS&ILLUSTRATION

Figure 2

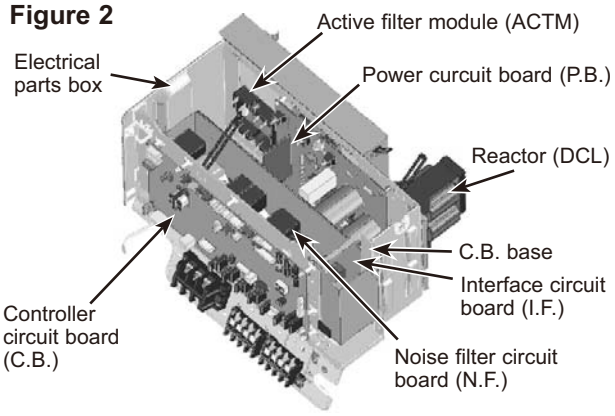


Photo 14

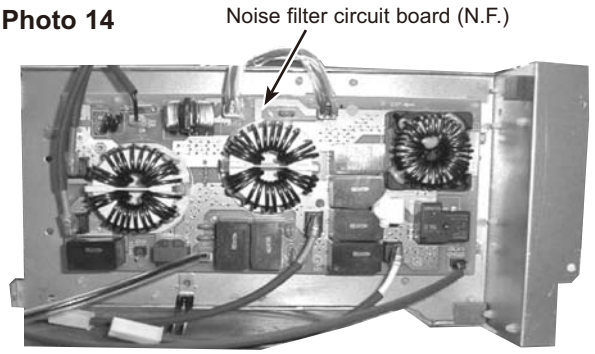


Photo 15

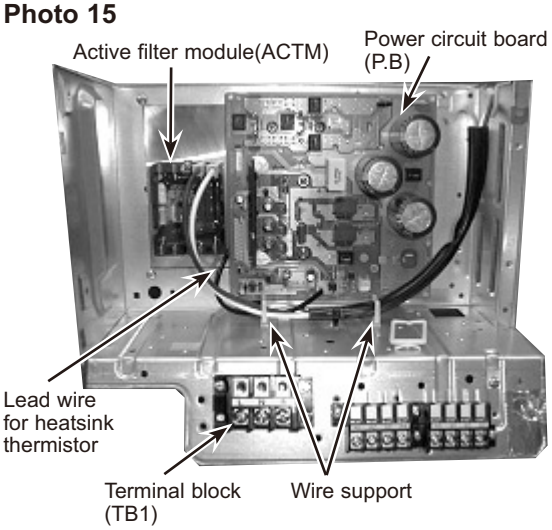
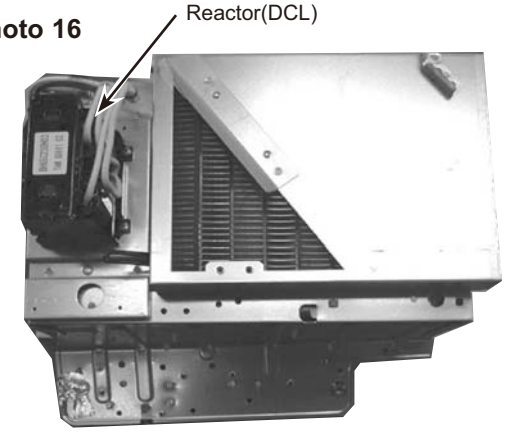


Photo 16



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